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**FEDERAL GOVERNMENT
SOFTWARE MARKET
STUDY:**

FINAL REPORT



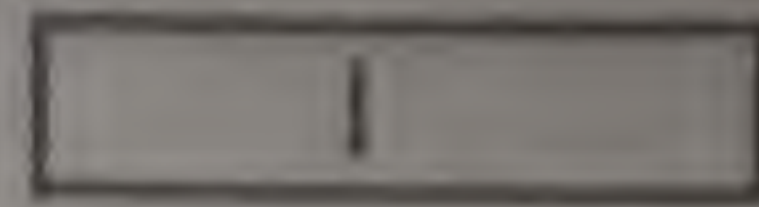


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Executive Summary

The "*Federal Government Software Market Study: Final Report*" was prepared following a comprehensive face to face market survey of over 100 key senior informatics personnel with 29 federal government organizations¹. These individuals have considerable authority to acquire software packages and/or to develop software systems that meet the major corporate and departmental software requirements of their respective organizations. The survey took place during the months of June, July and August of 1989.

Representatives from a total of 29 federal government organizations, including 16 departments and 13 Crown corporations were interviewed. It is estimated that these organizations collectively account for just over 70% of all software expenditures in the federal government software market.

The ultimate aim of this document is to provide:

- ° *federal government departments, agencies and Crown corporations with comparative data that will assist them in preparing tactical and strategic information technology plans;*
- ° *software companies with aggregate data that will increase their understanding of the evolving software needs of the federal government and that will assist them in assigning R & D and marketing priorities; and*
- ° *the federal government with data to assist in planning important initiatives, such as cooperative systems development and software exchange programs.*

¹A total of 32 organizations, including 17 government departments and 15 Crown corporations, were contacted. The Department of National Defence, the Royal Canadian Mint and the Federal Business Development Bank decided not to participate. Several individuals from two of those organizations were interviewed.

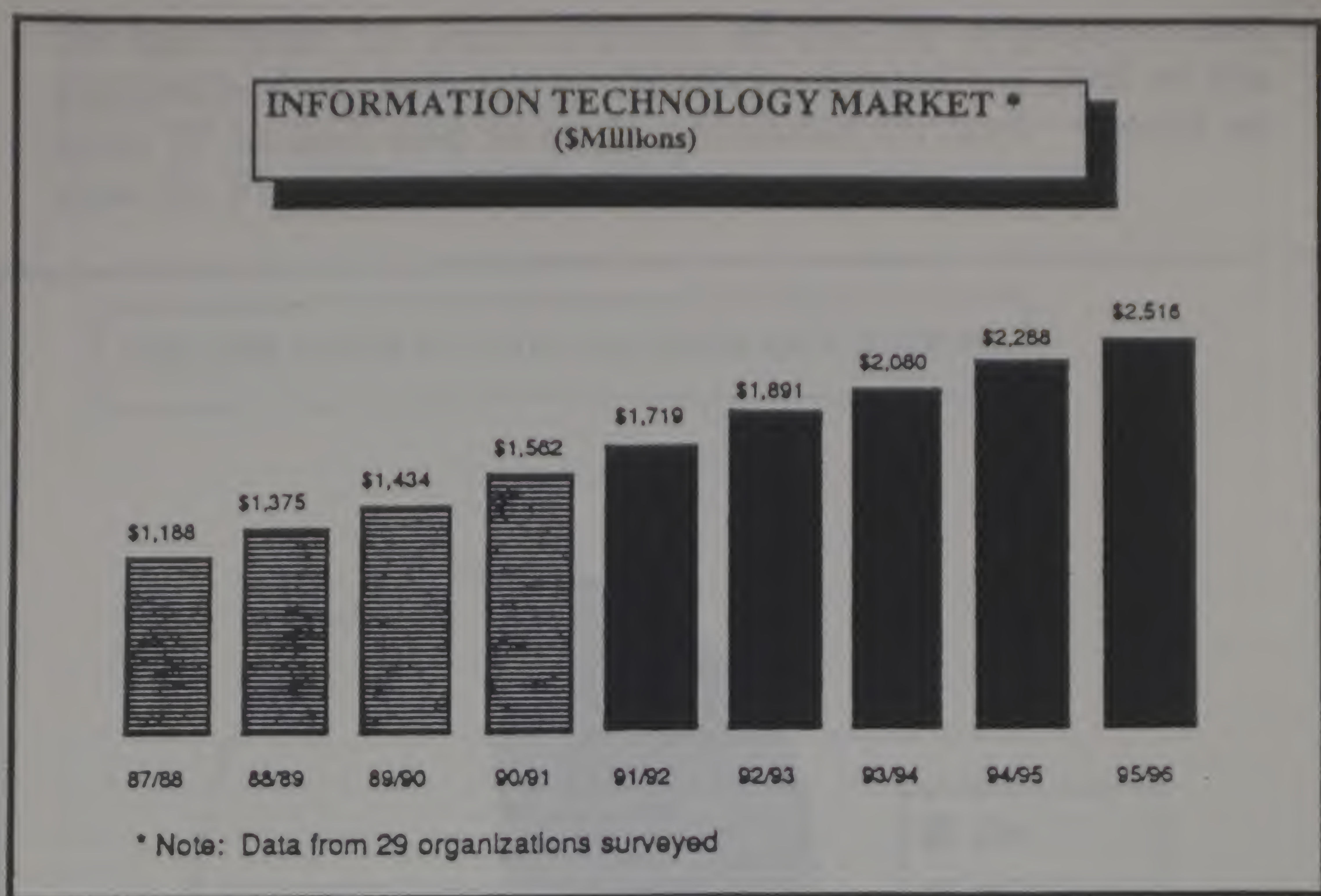


Young & Wiltshire conducted the study of the federal government software market on behalf of an Industry-Government Advisory Committee. Included on this committee are senior representatives from the Canadian Advanced Technology Association (CATA), the Canadian Information Processing Society (CIPS), Canada Mortgage and Housing Corporation (CMHC), Communications Canada, Supply and Services Canada, the Treasury Board of Canada and Transport Canada. The following *final report* details the key findings of this research initiative.

Highlights

Information Technology Budget

The combined Information Technology (IT) budget of the 16 government departments and 13 Crown corporations at the end of 1988-1989 was \$1.4 billion (excluding communications charges). This budget is expected to increase to \$1.5 billion by 1990-1991 and to 2.5 billion by 1995-1996. It is estimated that these figures represent 70% of the entire information technology budget of the federal government.

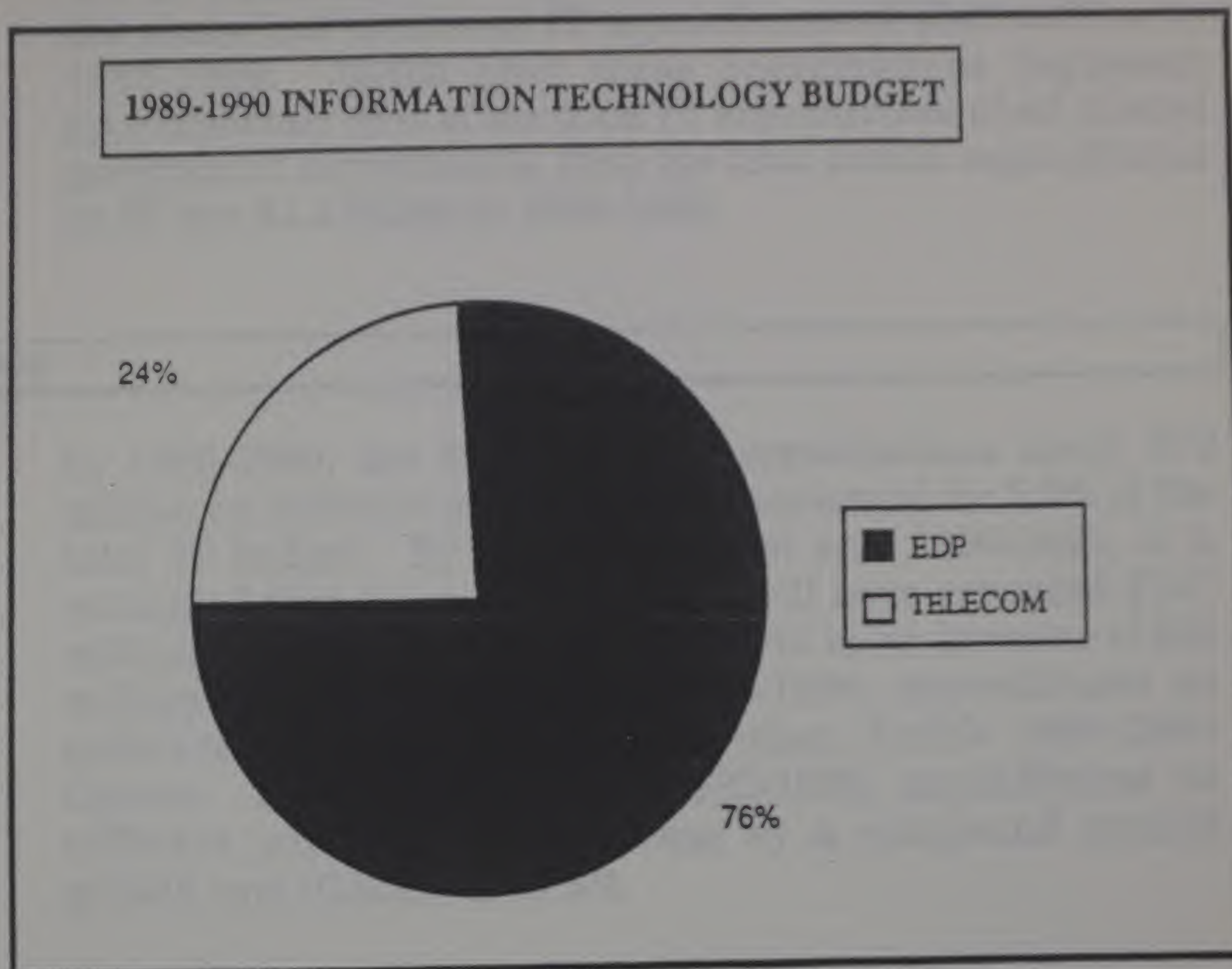


Based on the above mentioned data, the total information technology budget of the entire federal government can be estimated by increasing the total budget of 29 organizations by 30%. In 1988/89, therefore, the total federal government information technology budget in 1988-1989 was \$1.8 billion. This will reach approximately \$3.15 billion by 1995-1996.

It is useful to compare the federal government market (including federal government departments, Crown Corporations, and agencies) relative to the entire Canadian information technology market. It is estimated that the public sector (including federal, provincial and municipal government institutions) represents 40% of the entire Canadian IT goods and services marketplace. The federal government market alone is estimated to account for 18% of the entire Canadian IT marketplace. Based on this estimate, the size of the total Canadian IT marketplace for goods and services is approximately \$7.75 billion.



Of the total IT expenditures of the 29 organizations, electronic data processing (EDP) accounted for 76% of the total IT budget and telecom accounted for 24% (based on data for Fiscal Year 1989-1990).



The total IT budgets of 13 Crown corporations and 16 government departments combined accounted for 33% and 67% of the combined IT budget respectively.

It is interesting to note that Crown corporations spent 82% of their IT dollars on EDP compared to 75% by federal government departments. The fact that federal government departments allocate more of their budget to telecom is due to the larger number of regional and district offices.

The 13 Crown corporations who participated in the study had a combined IT budget of \$451 million in 1988-1989. Given

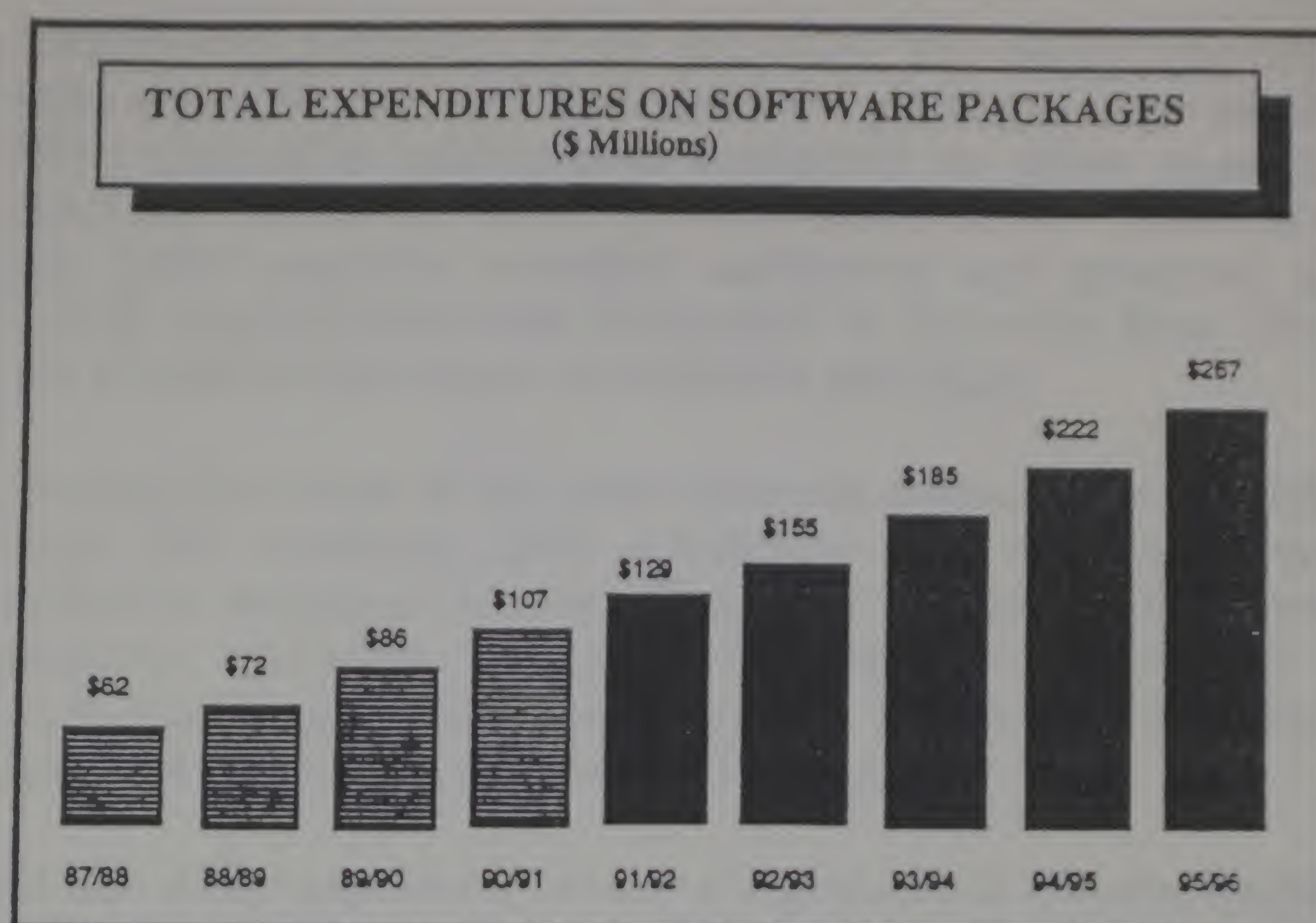


that these organizations represent 75% of the total IT expenditures of all Crown corporations, then the total annual expenditures on IT was \$586 million in 1988-1989.

The 16 federal government departments who participated in the study had combined IT expenditures of \$923 million in 1988-1989. Given that these organizations represent approximately 65% of the total IT expenditures of all federal government departments, then the total annual expenditures on IT was \$1.2 billion in 1988-1989.

Software

In 1988-1989, the 29 respondent organizations spent \$72 million on software packages. This accounted for 5.2% of the total IT budget. By the end of fiscal year 1990-1991, it is estimated that these organizations will have expended \$107 million on software packages. This will be an increase of \$35 million over two years. By 1995-1996, expenditures on software packages will be more than double 1990-1991 figures. From 1987-1988 to 1995-1996, expenditures on software packages will increase by a compound annual growth rate (CAGR) of 17.5%.



Over eighty percent of the software acquired was unbundled. MVS and MS-DOS based software accounted for 37% and 28% in 1988-1989. This, however, is expected to dwindle by the end of 1990-1991 due to a large increase in expenditures on VMS based software. The following table provides a breakdown of expenditures by operating systems.

Operating System	1988-1989	1990-1991
MVS	37%	32%
MS DOS	28%	23%
VMS	10%	21%
AOS/VS	2%	4%
VM	2%	2%
UNIX	1%	4%
MAC OS	1%	0%
MPE	1%	1%
OS/2	0.25%	0.5%
Others	18%	14%



Despite the notoriety it has achieved, this study also found that expenditures on UNIX software packages were smaller than originally anticipated compared to other operating systems. UNIX is, however, very much alive. There are a few 'pilot' projects currently underway and planned, and UNIX expenditures are forecasted to increase from 1% to 4% of total dollars spent on software packages.

During the course of the interviews the respondents identified over 169 desktop, 119 midrange and 395 mainframe software packages in use. The most frequently mentioned desktop software packages in use throughout all 29 organizations were WordPerfect, Lotus 1-2-3, dBase, Harvard Graphics and Norton Utilities.

At the midrange level, Oracle Corporation's Oracle, Cognos, PowerHouse, Access Technology's 20/20, DEC's All-In-One and Microsystems Engineering Corporation's MASS-11 were frequently mentioned.

Finally, at the mainframe level, IBM's DB2, Software AG's Natural/Adabas, Cullinet's IDMS(R), and SAS Institute's SAS were among some the most frequently mentioned products.

The results of the study clearly confirm that the penetration of Canadian developed software packages in the federal government market is extremely low. Of the 169 desktop packages identified, only 2%, or nine products were Canadian similarly of the 119 midrange software products identified only 3 were Canadian. Finally, of the 395 mainframe products identified, only 12 were Canadian.

Therefore, with the exception of a few Canadian products, such as Cogno's PowerHouse, Synex's SQZ!, Fulcrum's Ful/Text, Pelada's Communique, Simware's SIM PC and SIM/3270, Corel's Corel Draw, ACDS's ACDS, Netron's Netron/CAP, Crowntek's Thru-put Manager, Watcom's Waterloo "C", University of Guelph's CoSy, University of



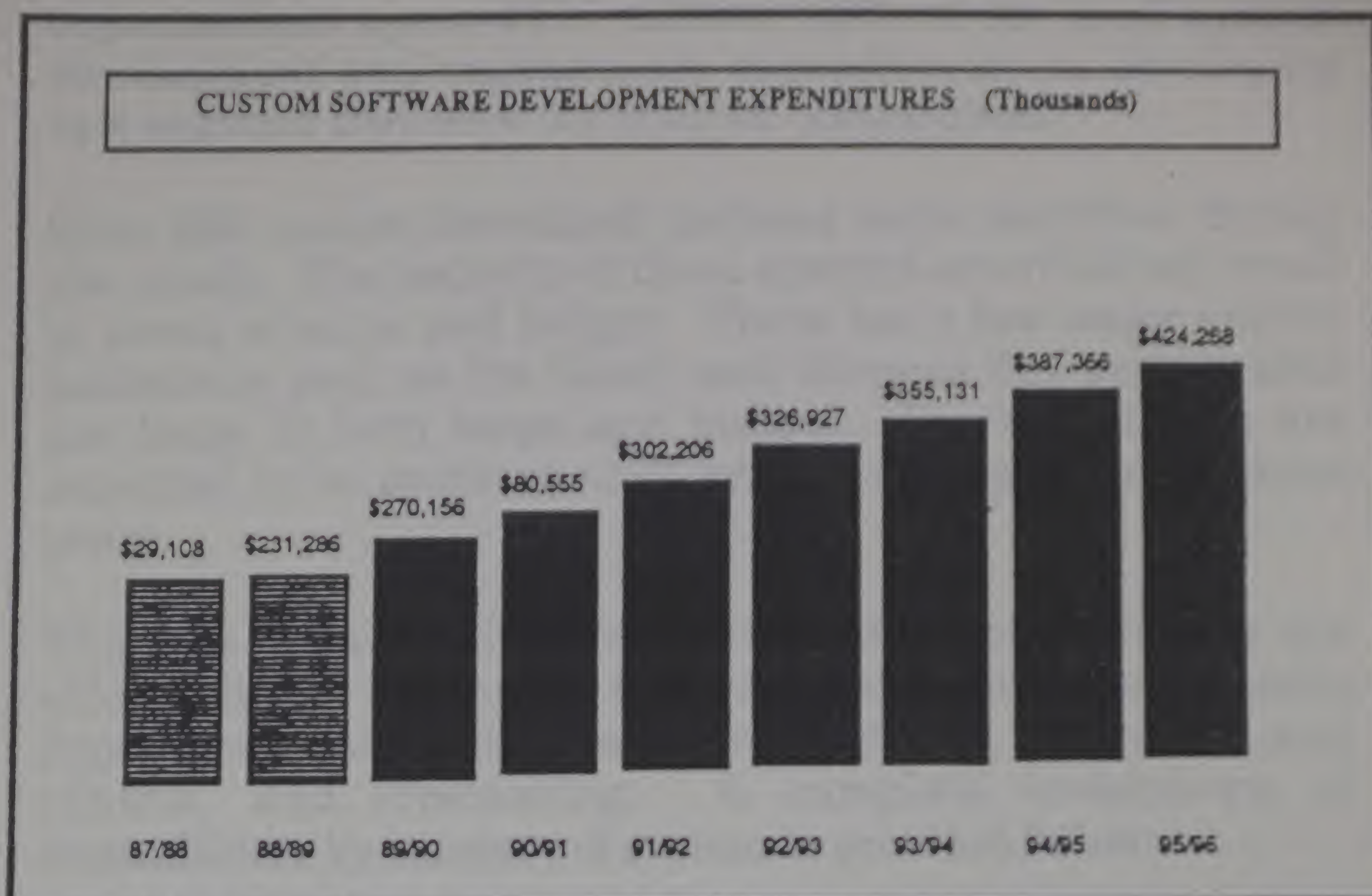
Toronto's The Solver, and Micro Tempus's Tempus-Share and Tempus-Link, the market is overwhelmingly dominated by foreign-based software package suppliers.

System Development and Maintenance

It is the system development and maintenance segment of the federal government IT market that indigenous Canadian suppliers have successfully penetrated. Some of the most frequently mentioned suppliers include: Domus, MacDonald, Dettwiler, Dynet, Prior Data Sciences, The Laurier Group (Touche Ross), Datacap, Systematix, Loecus, Synerlogic, Maxima Task Group, Venn, Data Kinetics, Quantum Management, LGS, Indigo, DMR, Systemhouse and CGI.

In total, the 29 organizations spent \$231 million on system development and maintenance in 1988-1989.¹ This accounted for 16.8% of the combined IT budget. System development and maintenance expenditures are estimated to grow by a compound annual growth rate of 6% during the period from 1987-1988 to 1995-1996.

¹System development and maintenance figures cited in this report do not include training, purchased software packages and other related EDP costs.



System development person-years will grow at a compound annual growth rate of 3.5%, from 4,009 person-years to 5,477 person-years, during the same timeframe.

Expenditures on system maintenance accounted for 52% of the total system development and maintenance dollars in 1988-1989.

Expenditures on private sector contractors will increase as a percentage of total system development and maintenance expenditures. In 1988-1989, the respondent organizations allocated 31% of the combined system development and maintenance expenditures, or \$72 million to private sector firms and/or individuals. This is expected to increase to 41%, or \$116 million, in 1990-1991.

One of the most significant findings of the study is the wealth of custom developed software available within the federal government market. In 1988-1989 alone, the 29



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organizations spent \$111 million (48% of the total system development and maintenance expenditures) on developing new systems that were not sourced off-the-shelf.

Over 250 custom developed systems were identified during the study. The majority of these systems are relatively small in terms of scope and budget. There are a few major system initiatives, such as the Goods and Services Tax system, that are large in both scope and budget. Several millions are expected to be spent on GST system during the next three years.

The vast majority of system development expenditures are allocated to Financial Systems, systems that handle expenditure accounting and transactions, budgeting and control, and forecasting. A complete breakdown of expenditures by category of system is provided below:

<u>System Category</u>	<u>% of System Development Expenditures</u>
Financial	32%
Program Management	28%
Administration	13%
Human Resources	8%
Data Analysis	4%
Text Management	2%
Other	13%

Procurement Process

Seventy-nine percent of the respondents indicated that software acquisition was a predominantly centralized process in that the informatics shop reviews and/or approves all significant software purchases.

Seventy-five percent of the study respondents indicated that approval of and acquisition of midrange and mainframe software was primarily conducted by the informatics group. On average, the respondents indicated that 37% of all desktop software was purchased by groups other than the informatics group.

Seventy-five percent of all software is acquired by headquarters. Over 50% of all software is acquired by the Informatics shop.

Despite expressed interest in using 'off-the-shelf' software packages, most respondent organizations rely heavily on custom development to address unique requirements.

Hardware

In total, there were 29,084 systems installed as of March 31, 1987. By the fiscal year 1990-1991, it is estimated that there will be an installed base of 79,333 systems. Over four years, the inventory will have grown at a compound annual growth rate (CAGR) of 28.5%. It is estimated that, among the 29 organizations who participated in the study, approximately 13,500 systems will be acquired each year.

Desktop computers represent 98% of all hardware systems installed in these organizations. Desktop computers are growing at a compound annual growth rate of 28.6%. Single-user workstations account for 95.5% of all desktop computers installed.

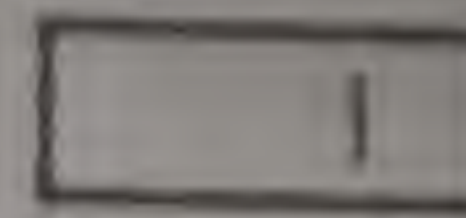
The dominant desktop computer is the ubiquitous IBM PC and/or Compatible. Apple Macintoshes represent a 'distant' second in

terms of installed stock. Currently, the installed base of Macintoshes account for 5% of the total population of desktop computers.

Midrange computers, systems ranging in price from 15K to 999K, are experiencing solid growth in the federal government market. As of March 31, 1987, there were 540 midrange systems installed. It is estimated that this base will increase by a compound annual growth rate of 26.6% to a total of 1,385 units in 1990-1991 (See Exhibit 45). Based on 1988-1989 data, there are an average of 35 midrange computers for each of the organizations interviewed. Digital Equipment VAX systems have the largest share of the midrange computer market in the federal government.

Since March 31, 1987, the stock of mainframes has increased by 24 units from 89 to 118 in 1990-1991. Apart from 1988/89 where 20 mainframes were acquired, the number of mainframes has increased by approximately 3 each year. Growth in mainframes will be marginal due to the cost and functionality attractiveness of desktop and midrange machines.

The standard hardware platforms are IBM PC and/or Compatibles at the desktop level, Digital Equipment's VAX systems at the midrange level, and IBM S/370 architecture (i.e. 3090, 30XX, 43XX) at the mainframe level.



1.0 - STUDY INTRODUCTION

1.1 - Study Rationale

The rationale for the *"Federal Government Software Market Study: Final Report"* emanated from the November/1987 report entitled: "Promotion of Canadian Software within Federal Government Departments" prepared by the Department of Communications. The report confirmed a number of factors. One, Canadian software developers have established an internationally recognized reputation for their skills and expertise in software research and development. Two, Canadian users continue to purchase and/or use non-Canadian software products. Three, expenditures on truly Canadian software range between 10 and 20 percent of all federal government software procurement. In summary, these factors clearly indicate that the share of the federal government software market by Canadian suppliers is relatively small.

The report goes on to suggest that the federal government can contribute significantly towards increasing the use of Canadian software by:

- o establishing a Canadian Software Assessment Centre (CSAC);
- o developing a Canadian software knowledge bank; and
- o providing on-line access to all government departments from anywhere in Canada.

The federal government software market represents a large percentage of the overall software market in Canada. This has been confirmed by a number of studies conducted during the last five to ten years. The importance of the federal government as a



consumer was clearly identified in a 1986 report which indicated that the federal government acquired more than 76 million dollars worth of software. Of this total, however, less than one fifth was expended on products from Canadian companies.

The fundamental challenge facing Canadian software suppliers in the federal government marketplace, and industry wide, is the lack of user awareness. This is a direct result of either the lack of a requisite understanding of how to market products in a highly competitive marketplace or the necessary funding to finance marketing initiatives, or both.

In an effort to act upon the recommendations in the November/1987 report entitled: "Promotion of Canadian Software within Federal Government Departments", Communications Canada initiated a study of the Federal Government Software Market.

There are a number of factors that continue to impact the success of Canadian suppliers in federal government software market. Users are constantly deluged with newer technologies making the decision to procure a particular product an arduous and complex task. The lack of credible data on the capabilities, performance and acceptance of Canadian software products is major problem. As a result, this lack of information may have encouraged the user to standardize on products that are widely used instead of products that may be technically more advanced.

The rate of absorption is also relatively low. Quite simply, users are reluctant to introduce unknown or unproven software for fear of jeopardizing current individual, departmental and corporate systems.

The lack of useful information and the rate of absorption of software can be changed by providing Canadian suppliers with strategic marketing intelligence regarding the current and future needs of the federal government and by establishing a mechanism that evaluates Canadian products and disseminates accurate information regarding these products to individuals who influence and make the purchase decision.

Young & Wiltshire conducted the study of the Federal Government Software Market on behalf of an Industry-Government Advisory Committee. Included on this committee are senior representatives from the Canadian Advanced Technology Association (CATA), the Canadian Information Processing Society (CIPS), Canada Mortgage and Housing Corporation (CMHC), Communications Canada, Supply and Services Canada, the Treasury Board of Canada and Transport Canada. The following *final report* details the key findings of this research initiative.

1.2 - Objectives

The objectives of the study were:

- ° to profile current and future government purchased and internally developed software;
- ° to estimate total yearly value of purchased, internally developed software, including "bundled" software and estimate the value of Canadian produced software;
- ° to rank software according to its frequency of use or its popularity;



- to classify software by hardware category (mainframe, mini, micro) and by function and estimate future software needs by hardware class and by function; and
- to identify existing "do facto" standards by category of hardware.

1.3 - Scope

The study was limited to software usage and needs in the federal government. A total of 29 departments, agencies and crown corporation, who account for approximately 70% of the total software expenditures by the federal government, were investigated to produce accurate and useful data on software usage, value, needs, and origin.

1.4 - Study Assumptions

To conduct a study of this scope and timing, assumptions must be made and limitations identified. These are outlined below:

- The study assumes that the EDP department head is a good source of tactical and strategic information regarding current inventories and use of packaged and internally developed software, and future plans to acquire and use packaged and/or develop software. It will also be assumed that this person is responsible for on-going monitoring of environmental developments in software market and how they may impact their respective organizations on a short term and long term basis.



- ° It is assumed that each tier of computing, namely micro, midrange and mainframe are becoming more integrated as a result of users and traditional data processing specialists requiring equal access to corporate and departmental data. Therefore, the traditional EDP environment is becoming more involved in and aware of the implementation of microcomputer based systems in localized user domains, as well as traditional midrange and mainframe based systems.
- ° This study assumes that the bulk of software purchase and internal software development activity in the federal government is concentrated in the National Capital Region.

1.5 - Benefits of the Study

The benefits of this study are threefold:

- ° federal government departments, agencies and Crown Corporations will have comparative data that will assist them in preparing tactical and strategic information technology plans;
- ° software companies will have aggregate data that will increase their understanding of the evolving software needs of the federal government and that will assist them in assigning R&D and Marketing priorities; and
- ° the federal government will have data to assist in planning important initiatives, such as cooperative systems development and software exchange programs.



1.6 - Study Methodology

The methodology employed in this study was 'face to face' interviews with key senior informatics representatives who have recognized authority to acquire software packages and/or to have developed software systems. However, before conducting the interviews, Young & Wiltshire conducted a literature search to identify the top spenders on software within the federal government market.

1.6.1 - Literature Search

The following sources were investigated:

Public Accounts

The Public Accounts System is designed to provide a detailed record of actual expenditures on all goods and services for schedule A and B Government departments by year. Expenditure information is classified by general goods and service categories and submitted by each department. The benefits and limitations of the Public Accounts data are described below:

Benefits:

- ° all departmental EDP and telecommunication expenditures must be reported;
- ° coding system allows for a breakdown of software expenditures for pre-packaged and system development software; and,
- ° data is based on actual monies spent not commitments or standing offers.



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- all departmental EDP and telecommunication expenditures must be reported;
- coding system allows for a breakdown of software expenditures for pre-packaged and system development software; and,
- data is based on actual monies spent not commitments or standing offers.

Limitations:

- expenditures for schedule C organizations (Crown Corporations, Special Funds and Business Enterprises) are in most cases not reported;
- the coding of expenditures is inconsistent across departments; and,
- data for detailed analysis of software by operating system, hardware country of origin and bundled vs. unbundled is not available.

GSIN

The Goods and Services Identification Number System (GSIN) was developed to provide for coding of contractual statistical data. It provides data regarding contractual commitments for all Schedule A and B departments and selected Schedule C corporations. Expenditure commitments are classified by Goods & Services product managers into specific categories. The benefits and limitations of the GSIN data are described below:

Benefits:

- detailed breakdown of software commitments by application, country of origin and hardware allows for statistical analysis through the use of percentages that are applied to actual expenditures derived from the Public Accounts.

Limitations:

- data compiled for specific categories are commitments only, not actual yearly expenditures; and,

- use of the data for comparative analysis is limited due to the length of the commitments (two years) and the uncertainty of the commitment translating into an actual expenditure.

ITSP

The Information Technology Systems Plan (ITSP) is the mechanism designed to obtain Treasury Board approval for significant information technology acquisitions and projects. Expenditure data is submitted by all Schedule A and B government departments. The benefits and limitations of the ITSP data are described below:

Benefits:

- the plans provide the most accurate picture for short term systems development and expenditures by department; and,
- the plans provide the most reliable estimate for internally developed software expenditures.

Limitations:

- information on Schedule C corporations is not provided;
- a large percentage of departments do not complete all sections of the plans; and,
- expenditure data for the current year is an estimate only as plans are submitted prior to year end.

1.6.2 - Top Federal Government Software Purchasers

The literature search uncovered seventeen federal Schedule A and Schedule B organizations who account for approximately 80% of

software market. Based on aggregate data from ITSP and Public Accounts, the top Federal Government departments ranked on estimated software expenditures are provided in Table 1.

TABLE 1

ESTIMATED SOFTWARE EXPENDITURES BY DEPARTMENT (EXCLUDING BUNDLED EXPENDITURES) 1987-1988			
RANK	DEPARTMENT	SOFTWARE EXPEND. EST. \$,000	%
1	NATIONAL DEFENCE	\$35,000	
2	TRANSPORT	\$20,000	
3	CUSTOM & EXCISE	\$14,500	
4	PUBLIC WORKS	\$12,000	
5	HEALTH & WELFARE	\$11,000	
6	ENVIRONMENT CANADA	\$10,000	
7	NATIONAL RESEARCH COUNCIL	\$10,000	
8	SUPPLY & SERVICES	\$9,000	
9	TAXATION	\$7,000	
10	ENERGY MINES RESOURCES	\$7,000	
11	FISHERIES & OCEANS	\$5,500	
12	REGIONAL & INDUSTRIAL EXPANSION	\$5,000	
13	AGRICULTURE CANADA	\$4,000	
14	STATISTIC CANADA	\$4,000	
15	CIDA	\$4,000	
16	COMMUNICATION	\$3,000	
17	EXTERNAL AFFAIRS	\$3,000	
TOP 17 - TOTAL		\$164,000	80%
ALL DEPARTMENTS (PROJECTED) - TOTAL		\$205,000	100%

SOURCE: PUBLIC ACCOUNTS and ITSPs

Due to the lack of published data it was impossible to rank Schedule C organizations, specifically Crown Corporations, according to overall software expenditures. Alternatively, these organizations were ranked by employee size and total revenues as shown in Tables 2 and 3. It has been assumed that there is some direct relationship between these attributes and the amount they expend on software.



TABLE 2

CROWN CORPORATIONS: RANKED BY REVENUE 1987-1988
--

RANK	NAME	REVENUE (\$ IN MILLIONS)
1	PETRO CANADA	\$5,079
2	CNR	\$4,600
3	CANADA POST	\$3,138
4	AIR CANADA	\$3,131
5	BANK OF CANADA	\$2,008
6	CANADIAN WHEAT BOARD	\$1,728
7	CBC	\$1,118
8	ROYAL CANADIAN MINT	\$1,032
9	CMHC	\$883
10	VIA RAIL	\$715
11	CANADIAN COMMERCIAL CORPORATION	\$688
12	EXPORT DEVELOPMENT CORPORATION	\$640
13	FARM CREDIT CORPORATION	\$380
14	ATOMIC ENERGY OF CANADA	\$290
15	FBDB	\$267
TOTAL		\$25,697
% OF TOTAL CROWN REVENUE (27,248)		94.30%

SOURCE: PUBLIC ACCOUNT RECORDS 1987-88, PART III CROWN
CORPS & OTHER GOVERNMENT INTERESTS

TABLE 3

CROWN CORPORATIONS RANKED BY EMPLOYMENT 1987-1988
--

RANK	NAME	EMPLOYMENT PROVIDED
1	CNR	49,317
2	CANADA POST	49,108
3	AIR CANADA	21,879
4	CBC	10,598
5	PETRO CANADA	8,517
6	VIA RAIL	5,726
7	ATOMIC ENERGY OF CANADA	4,892
8	CAPE BRETON DEVELOPMENT CORPORATION	3,435
9	CMHC	3,029
10	BANK OF CANADA	2,200
11	MARINE ATLANTIC CORPORATION	1,957
12	FBDB	1,202
13	CANADIAN DEVELOP INVEST CORP	1,011
14	ST. LAWRENCE SEAWAY AUTHORITY	985
15	ROYAL CANADIAN MINT	832
TOTAL		164,688
% OF TOTAL CROWN EMPLOYMENT (171,410)		96.10%

SOURCE: PUBLIC ACCOUNT RECORDS 1987-88, PART III CROWN CORPS & OTHER GOVERNMENT INTERESTS

Therefore, for the purposes of this study, it has been assumed that the total software expenditures of the Crown corporations identified in Tables 1 and 2 probably represent 80% of the total dollars spent on software by Crown corporations.

1.6.3 - Indepth Interviews

More than 100 senior informatics representatives, specifically at the Vice-President, Director-General and Director levels, from 32 organizations were interviewed face to face for the purposes of obtaining the desired information. In several cases, several



interviews were held with the same representative to obtain the desired information. On average, at least three individuals per organization were interviewed to obtain information that was available and to ensure a relatively high level of accuracy.

1.6.4 - Data Analysis

It was found during the literature search that consistent secondary data was not available for useful data analysis. For instance, the ITSP's were a reasonably accurate source of information for federal government departments but comparable data was not available for Crown corporations. Furthermore, the literature search uncovered inconsistencies in the reporting and coding of data in sources such as ITSP, GSIN and Public Accounts. Although these sources were used to identify key software spenders for the face to face interviews, the data presented in the following report is based on face-to-face interviews.¹

Of the 32 organizations identified only three - the Department of National Defence, Federal Business Development Bank, and the Royal Canadian Mint - elected not to participate in the study. The data presented in this report is from 29 organizations. It is important to note that:

- the 16 departments (excluding Department of National Defence) represent approximately 65% of the total software expenditures by all federal departments;
- the 13 Crown corporations (excluding the Royal Canadian Mint and the Federal Business Development Bank) represent approximately 75% of the total software expenditures by all federal Crown corporations; and,

¹ Where possible some secondary source material has been used in the absence of data from face to face interviews with these organizations. Such instances are noted throughout the report.

- ° the 29 organizations combined represent approximately 70% of the total expenditures on software by the federal government.

Finally, it should be noted that the numbers reflected in this report regarding expenditures on software packages, system development and information technology are different than those expressed in sources such as ITSP. In particular, these differences are noted below:

- ° the figures relating to expenditures on system development and maintenance cited in this report only include amount directly spent on development and/or maintenance of systems (specifically systems and project consultants, systems design, development, maintenance and enhancements). The data does not include expenditures on software packages used for development, user support and testing, and EDP training; and,
- ° the data expressed for total information technology market does not include communications charges.



2.0 - INFORMATION TECHNOLOGY MARKET

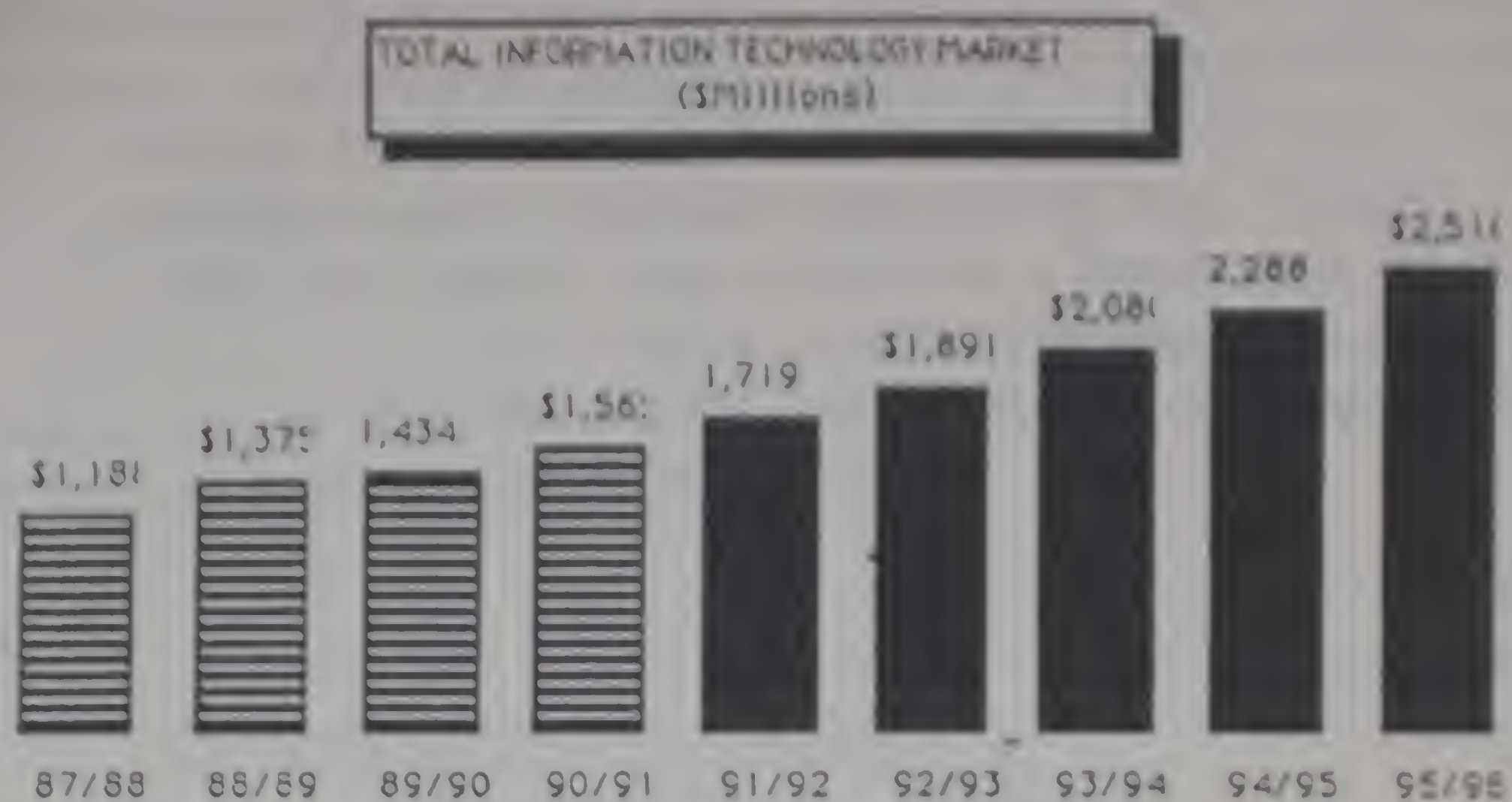
The following sub-section details the combined information technology budget of 29 federal government organizations. In total, the numbers provided for the 29 organizations represent approximately 70% of the total expenditures by the federal government on information technology. Furthermore, the numbers expressed in this section do not include communication charges.

2.1 - Total Market

The federal government market represents one of the largest individual segments of the overall Canadian information processing market place. As shown in Exhibit 1, the combined information technology budgets of the 29 organizations in 1988-1989 was \$1.4 Billion. It is estimated that, during the period from 1987-1988 to 1990-1991, the total information technology budget will have grown by a compound annual growth rate of 8.7%. In the year 1995-1996, the combined information technology budget of these 29 organizations will be almost double what it is today.



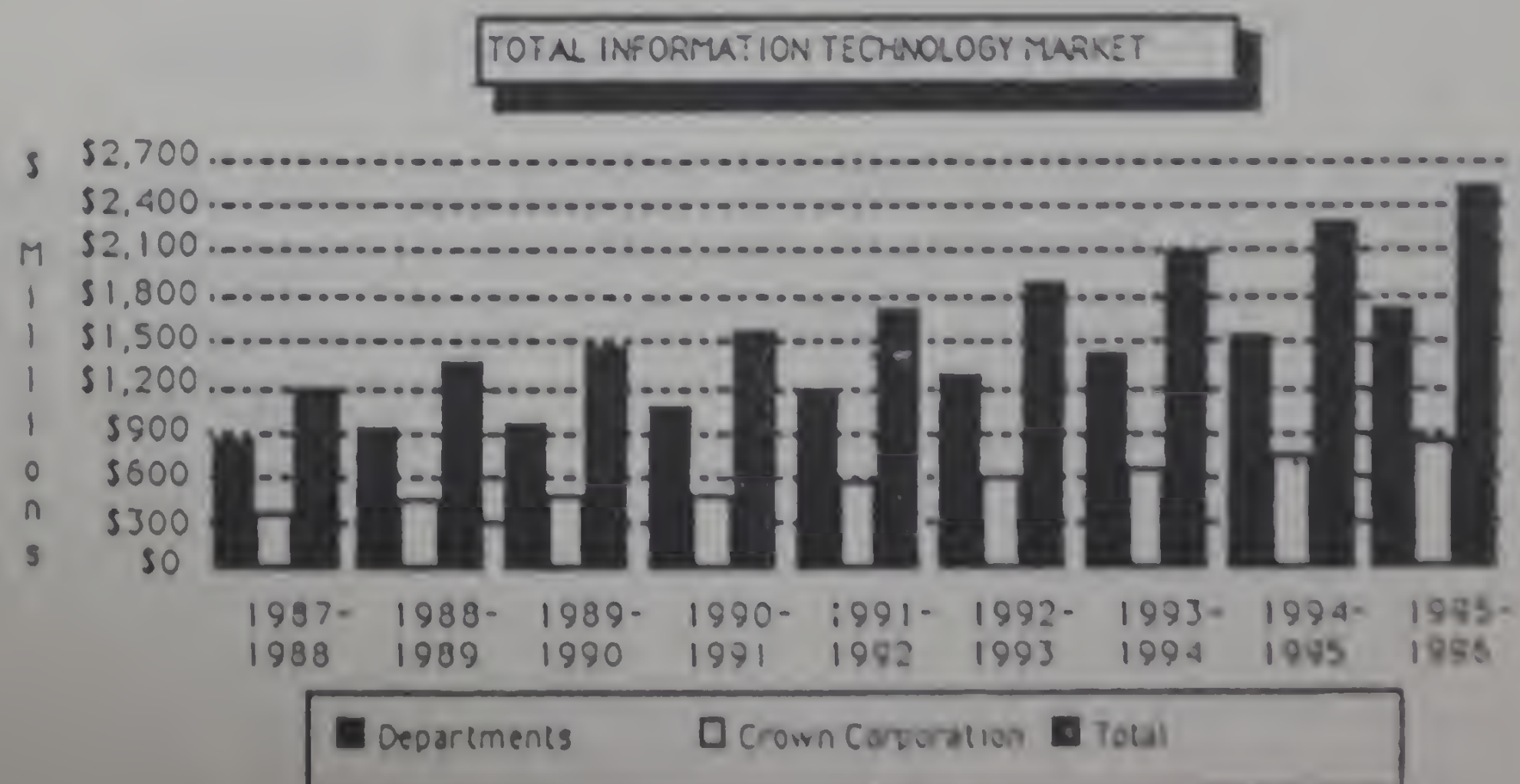
EXHIBIT 1



Number of Respondent Organizations - 29

Exhibit 2 clearly illustrates that the combined information technology budgets of 16 departments is double the aggregate information budget of the 13 Crown corporations interviewed during this study. It is apparent, therefore, that as an entity themselves, government departments are information processing intensive organizations.

EXHIBIT 2



Number of Respondent Organizations - 29



Finally, among the 29 organizations who participated in the study, it was found that EDP expenditures were triple that of Telecom expenditures. As shown in Exhibit 3, EDP accounts for 76% of the combined information technology budget. One caveat is in order, the data expressed does not include communications charges. It is well known that the federal government is a heavy user of voice communications. In fact, voice communication charges are significantly larger than the entire information technology budget in some federal government organizations.

EXHIBIT 3

1989-1990 INFORMATION TECHNOLOGY BUDGET
(\$1,434 Million)

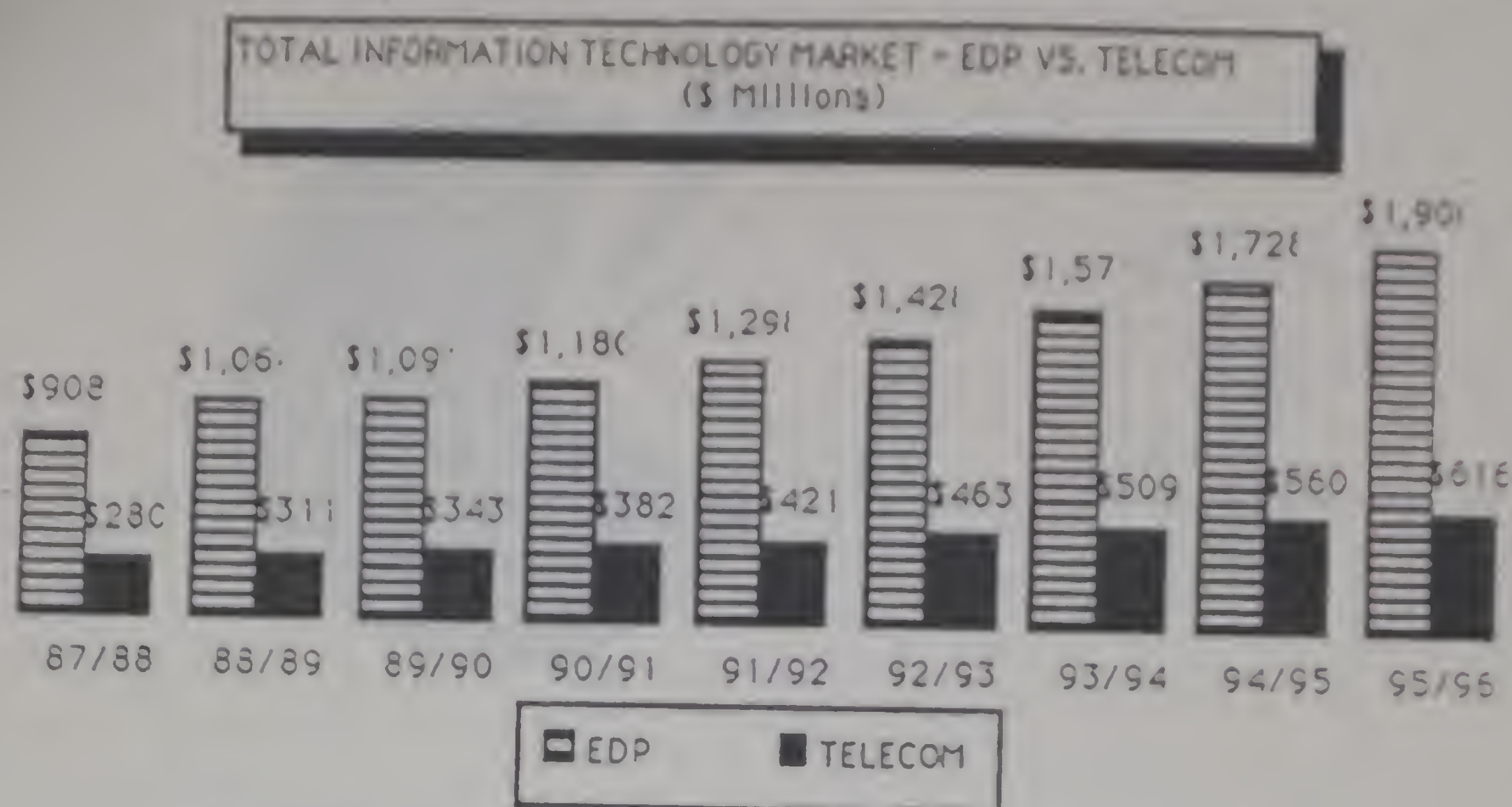


Number of Respondent Organizations - 29

It is expected that the EDP's percent of the total information technology budget in the federal government will continue to account for more of the information technology budget than Telecom (see Exhibit 4).



EXHIBIT 4

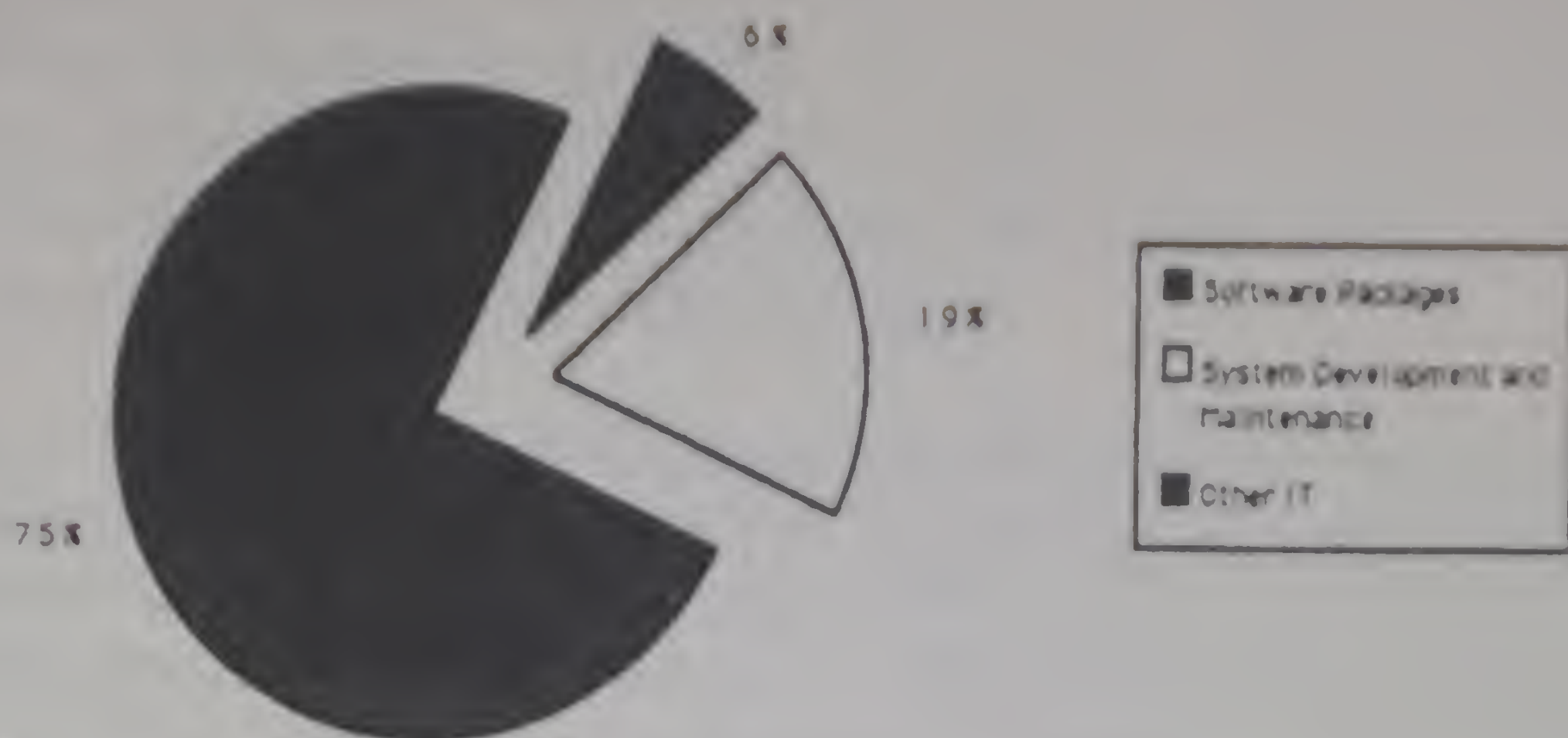


Number of Respondent Organizations - 29

Finally, of the \$1.4 billion technology budget in 1989-1990, the acquisition of software packages accounted for 6%. Expenditures on systems development accounted for 19%. Combined the 29 organizations contacted - spent 25% of their information budget on software as shown in Exhibit 5.



EXHIBIT 5



Federal government departments spend considerably more on information technology than the Crown corporations contacted. As shown below in Exhibit 6, expenditures by departments are almost double than spent by Crown corporations.

EXHIBIT 6

TOTAL EXPENDITURES ON INFORMATION TECHNOLOGY- BY TYPE
OF FEDERAL GOVERNMENT ORGANIZATION

	1987- 1988	1988- 1989	1989- 1990	1990- 1991	1991- 1992	1992- 1993	1993- 1994	1994- 1995	1995- 1996
Departments	\$819	\$923	\$957	\$1,056	\$1,162	\$1,278	\$1,406	\$1,547	\$1,701
Crown Corporationa	\$368	\$451	\$477	\$506	\$557	\$612	\$673	\$741	\$815
Total	\$1,185	\$1,375	\$1,434	\$1,562	\$1,719	\$1,891	\$2,080	\$2,288	\$2,516

Number of Respondent Organizations - 29

The total IT budget of the 13 Crown corporations interviewed accounted for 33%, or \$477 million, of the total IT budget of the 29 organizations contacted in 1988-89. As a group, the 13 Crown corporations allocated 79% of their IT budget to EDP in 1988-89. Finally, 7% of their entire IT budget in the same year was directed towards the acquisition of software packages.

The total IT budget of the 16 departments interviewed accounted for 64% of the total IT budget (for the 29 departments and Crown corporations) of \$1.4 billion in 1988-1989. EDP expenditures among these departments accounted for 74% of the total. Twenty-five percent of the budget was expended on Telecom in 1988-1989.¹

¹ It should be noted that despite the number of significant information system projects being conducted by major government departments this hasn't increased Telecom's share of the department's overall information technology expenditures.

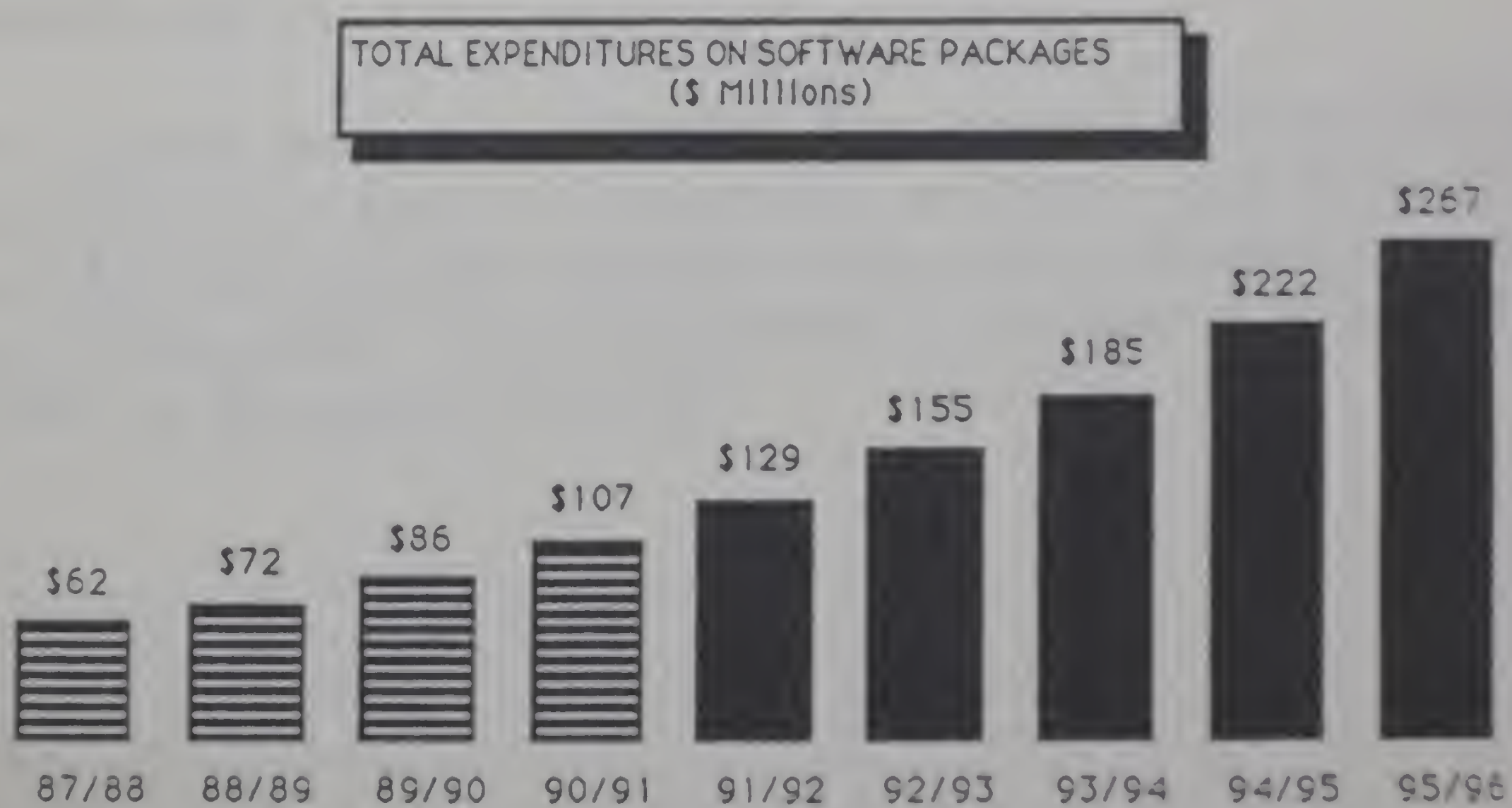


3.0 - SOFTWARE PACKAGE MARKET

3.1 - Total Market

As shown in Exhibit 7, the 29 organizations together spent \$86 million on software packages in 1988-1989. These expenditures are estimated to increase to \$267 million by 1995-1996. During the period from 1987-1988 to 1990-1991, expenditures on software packages will have grown by a compound annual growth rate of 17%. This figure is complimented by similar industry growth figures for Canada and other parts of the world cited by other market research organizations.¹

EXHIBIT 7



Number of Respondent Organizations - 29

Initially, it is somewhat surprising that expenditures on software packages will continue to increase given that the unit price of

¹ There are a plethora of studies that cite complimentary growth figures which have been prepared by International Data Corporation, Dataquest, Evans Research Corporation, Infocorp, to name only a few



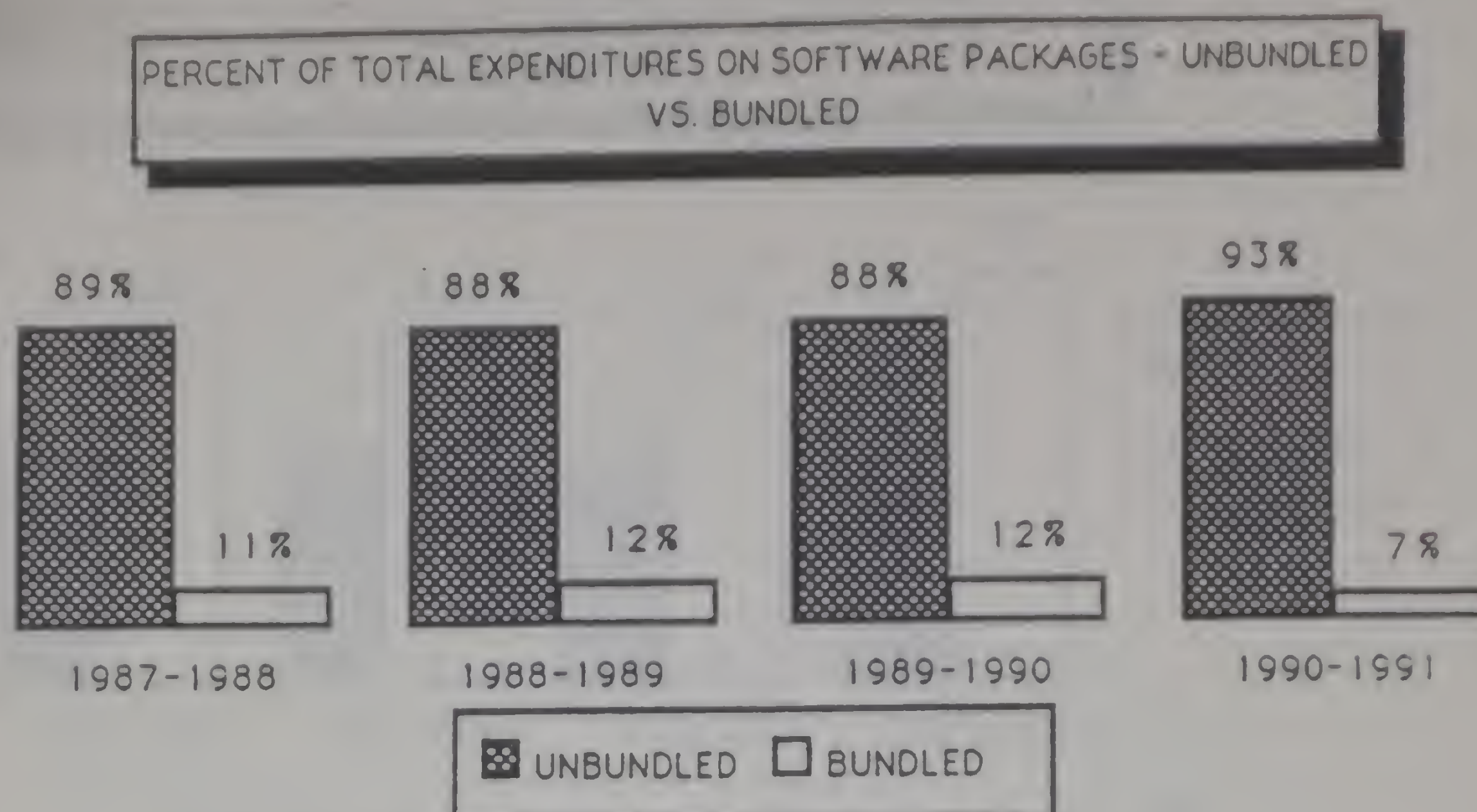
software in general has been decreasing (although most dramatically at the desktop level). However, almost all of the 29 organizations that participated in this study indicated that their goal is to have a desktop computer on every desk. Only one organization has achieved this objective. Of the remaining 28 organizations, only a handful are in a position to realize this goal in the next 2-3 years. Therefore, the task of placing a desktop on every desk will ensure steady growth in software package expenditures for the first half of the 1990's.

There are also exciting new advances in software technology that are constantly being introduced to the market, and there will be more in the future. These new developments will continue to have an effect on securing solid growth in software package expenditures.

Over eighty percent (see Exhibit 8) of annual software package expenditures is spent on unbundled software - software that is identified as a separate requisition item and not hidden as part of a total system price. This is estimated to increase to 93%, or \$99.5 million, by the end of 1990-1991.



EXHIBIT 8



Number of Respondent Organizations - 29

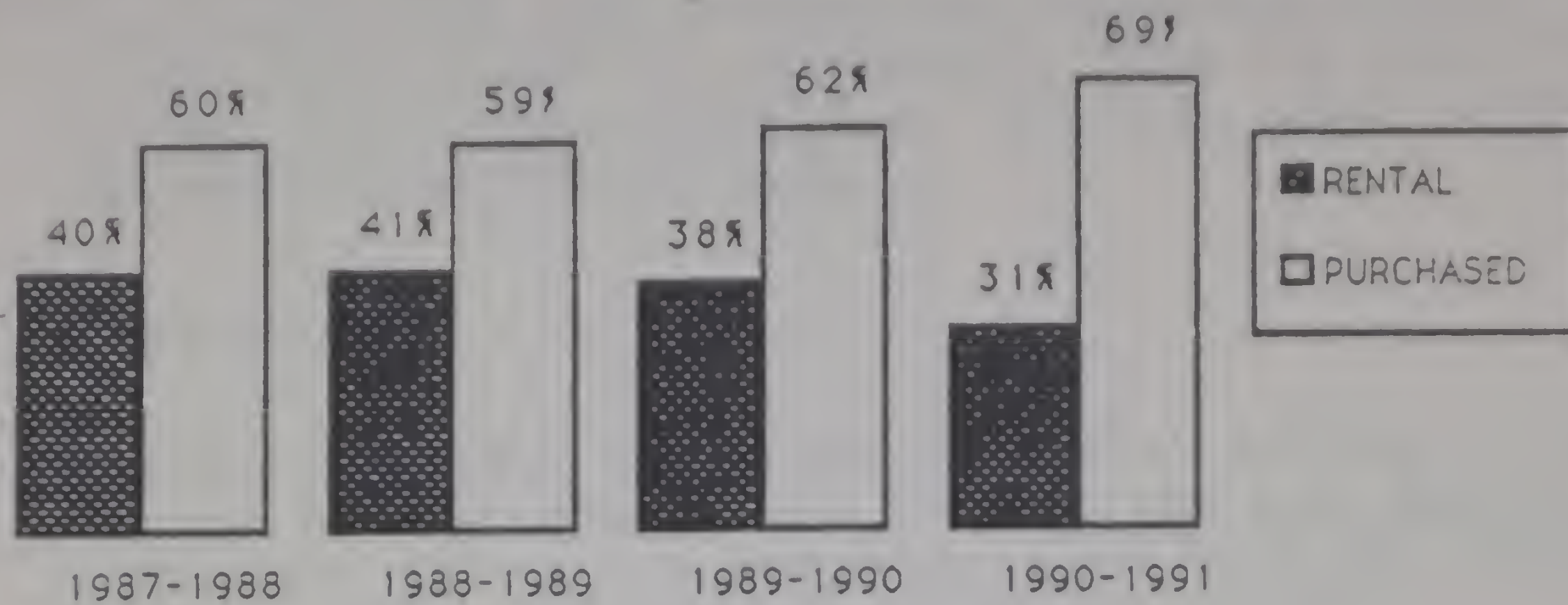
In 1988-1989, purchased software accounted for fifty-nine percent, or \$42 million, of software package expenditures. Exhibit 9 illustrates that this percentage will increase to 69% (\$74 million) in 1990-1991. Clearly the trend is towards purchase, rather than rental, of software packages.

The relatively high percentage of rental dollars is due to the large stock of IBM mainframes where the resident software is typically rented. However, there are strong signs that expenditures on rental software will decline due to the trend towards acquisition of desktop and midrange computers, static growth in mainframe computer acquisitions, and the trend towards purchase rather than rental of software packages.

EXHIBIT 9

23

PERCENT OF TOTAL EXPENDITURES ON SOFTWARE PACKAGES - RENTAL
VS. PURCHASED



Number of Respondent Organizations - 29

One interesting dimension on software package expenditures is the class of software being acquired. The organizations contacted were asked to break down their expenditures by the following categories:

Systems/Utilities

Systems/Utilities software are programs concerned with the operation of the computer and the running and testing of applications programs, particularly in relation to input/output. Included are Operating Systems, Debuggers, Interpreters, Compilers, Sort/Merge and Communications software.



User Tools

User Tools software are programs that assist in the development of other applications. These include traditional end-user tools, such as spreadsheets (e.g. 20/20, Lotus 1-2-3, Excel), and application development tools such as data base management systems (e.g. Oracle, DB/2), CASE (e.g. Excelsior), 4GLs (e.g. PowerHouse, Focus), Code Generators (e.g. Gamma), and Artificial Intelligence/Expert System Shells.

Applications

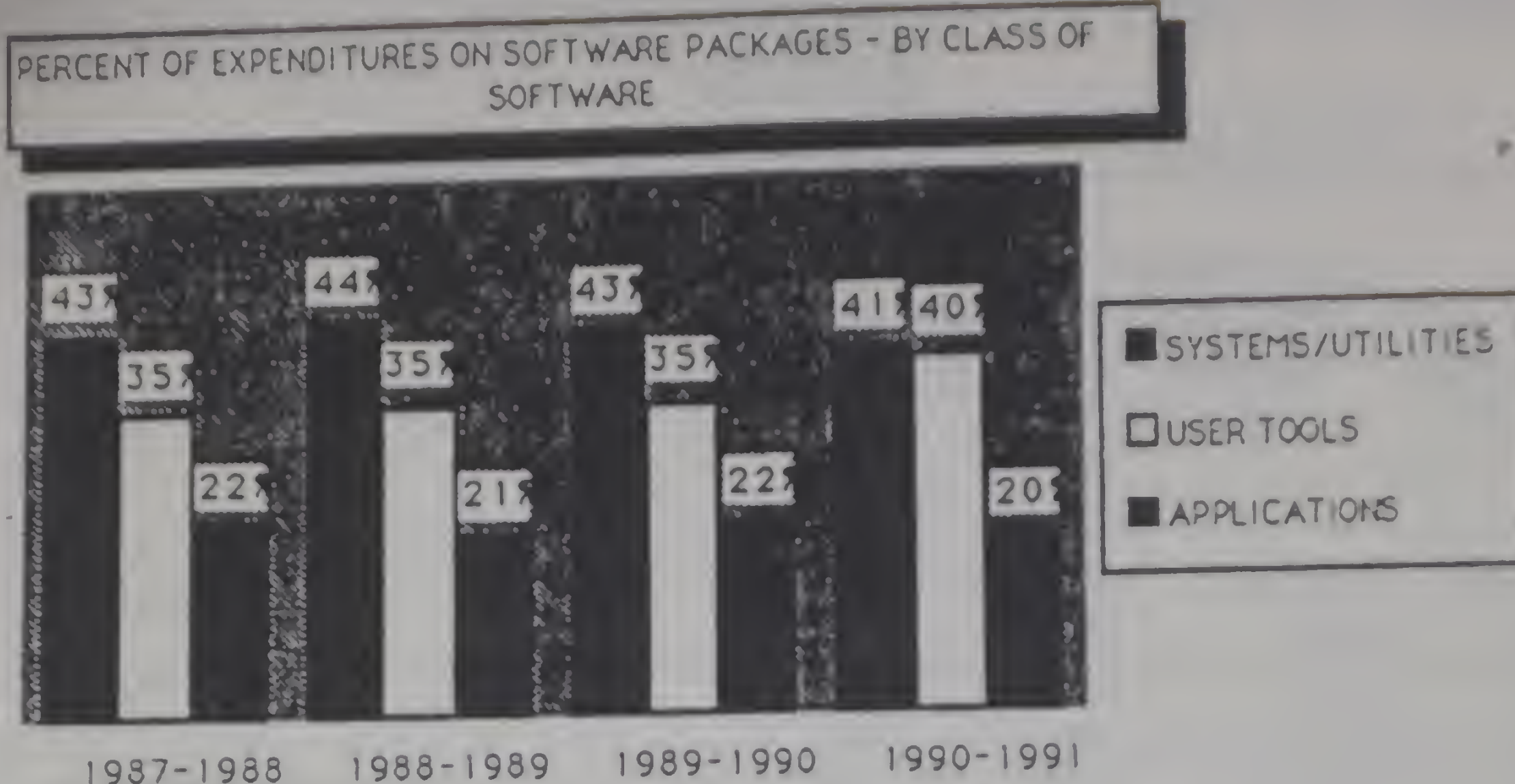
Applications software are programs that address a single requirement or are specific to a particular end use. Examples of applications software are: Accounting, Word Processing, Graphics, Integrated Office, CAD/CAM, Project Management, etc.

Despite the current attention given database and decision support tools in industry journals, magazines, and newspapers, Systems/Utilities still accounts for the largest share of the expenditures on software packages. This is expected to decrease in percentage terms yet increase in actual expenditures. For instance in 1988-89, expenditures on Systems/Utilities accounted for 44% (\$32 million). By 1990-1991, this will decline to 41% (\$44 million).

Users Tools, on the other hand, will experience growth in terms of market share and actual expenditures. It is estimated that from 1989-90 to 1990-91, expenditures on User Tools will increase by 43%, from \$30 million to \$43 million and its share of the market will increase from 35% to 40% (see Exhibit 10).



EXHIBIT 10



Number of Respondent Organizations - 29

Perhaps the most interesting finding of the study is the breakdown of software package expenditures by operating system. As illustrated in Exhibit 11, expenditures on MVS software by the 29 organizations still accounts for the largest portion. Although these are expected to increase in real dollars, expenditures on MVS software will decrease as a percentage of overall software expenditures.

This decrease in percentage is due the estimated expenditures on VMS software. Due to several significant projects involving VAX computers, expenditures in 1990-1991 will represent the third largest component.

EXHIBIT 11

TOTAL PACKAGED SOFTWARE EXPENDITURES - BY OPERATING SYSTEM DEPARTMENTS/CROWN CORPORATIONS
--

	ACTUAL		PROJECTED	
	1987-1988	1988-1989	1989-1990	1990-1991
	(\$,000)	(\$,000)	(\$0,000)	(\$0,000)
	(%)	(%)	(%)	(%)
MS-DOS	\$18,525 29%	\$20,538 28%	\$20,345 23%	\$24,374 23%
OS/2	\$11 0%	\$14 0%	\$136 0%	\$275 0%
Macintosh OS	\$339 1%	\$371 1%	\$365 0%	\$406 0%
UNIX	\$580 1%	\$719 1%	\$2,581 3%	\$4,352 4%
VMS	\$6,344 10%	\$7,595 10%	\$9,475 11%	\$22,656 21%
MVS	\$25,190 40%	\$26,411 37%	\$31,344 36%	\$34,482 32%
VM	\$865 1%	\$1,327 2%	\$1,458 2%	\$1,885 2%
AOS/VS	\$1,333 2%	\$1,716 2%	\$3,908 5%	\$3,921 4%
MPE	\$627 1%	\$612 1%	\$683 1%	\$780 1%
OTHER	\$9,396 15%	\$13,056 18%	\$16,032 19%	\$14,598 14%
TOTAL	\$63,208 100%	\$72,358 100%	\$86,596 100%	\$107,730 101%

Notes: (1) Percentage figures are rounded off to 0 decimal points.

Number of Respondent Organizations - 29

Expenditures on MS-DOS software represents the second largest group. However, expenditures on MS-DOS software will decrease in percentage terms. Once again, this is due to increase focus on WMS based software.

Expenditures on Unix based software are expected to increase, although it still represents a relatively small proportion of total package software expenditures.

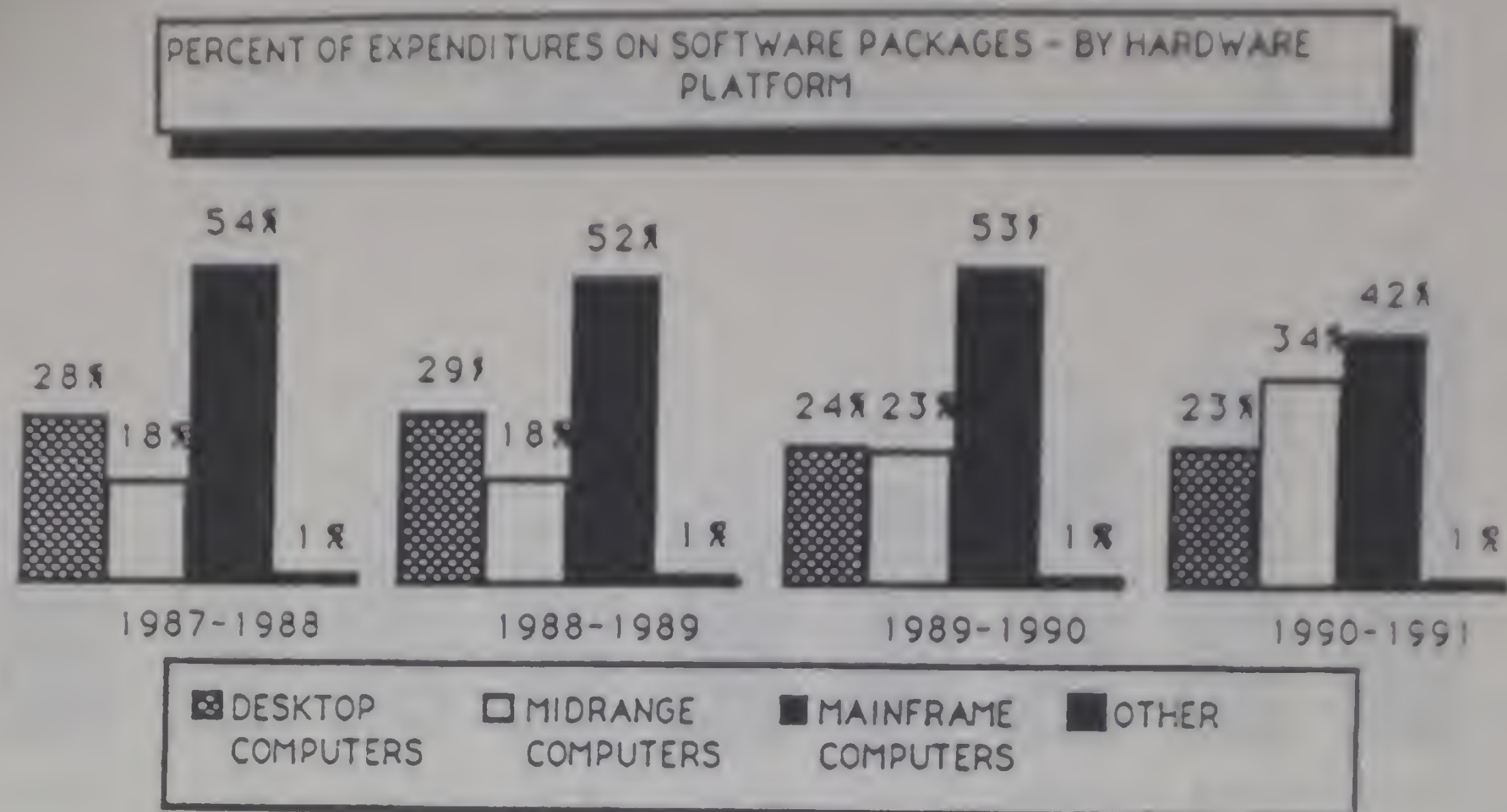
Certainly, in the short term, expenditures on OS/2 and Macintosh OS will continue to be relatively insignificant. In the case of OS/2, the federal government is taking a 'wait and see' approach. The widespread acceptance of and investment in MS-DOS, and widespread uncertainty about OS/2 as a viable alternative to MS-DOS clearly indicates that expenditures will remain small.

Macintoshes, in comparison, have been available on the market for quite sometime. Despite the attractiveness of the MAC's user friendly interface, its premium pricing and 'niche' positioning have impacted greater acceptance within the federal government market. Expenditures on Macintosh OS packaged software will therefore remain very small.

Finally, the lion's share of software is still being acquired for the mainframe environment, but there are signs that this will decrease. Faster and cheaper midrange computer offerings are eating away at the mainframe market; therefore, software expenditures on this platform are expected to decrease significantly (see Exhibit 12). As indicated earlier, this decrease is due to several major midrange system acquisitions in 1990-1991. During the study, some of the respondents indicated that have reached or are close to reaching their goal of putting a PC on every employee's desk. This, along with the cheaper unit price of packages software is an explanation for the gradual decrease in expenditures on software packages for Desktop computers.



EXHIBIT 12



Number of Respondent Organizations - 29

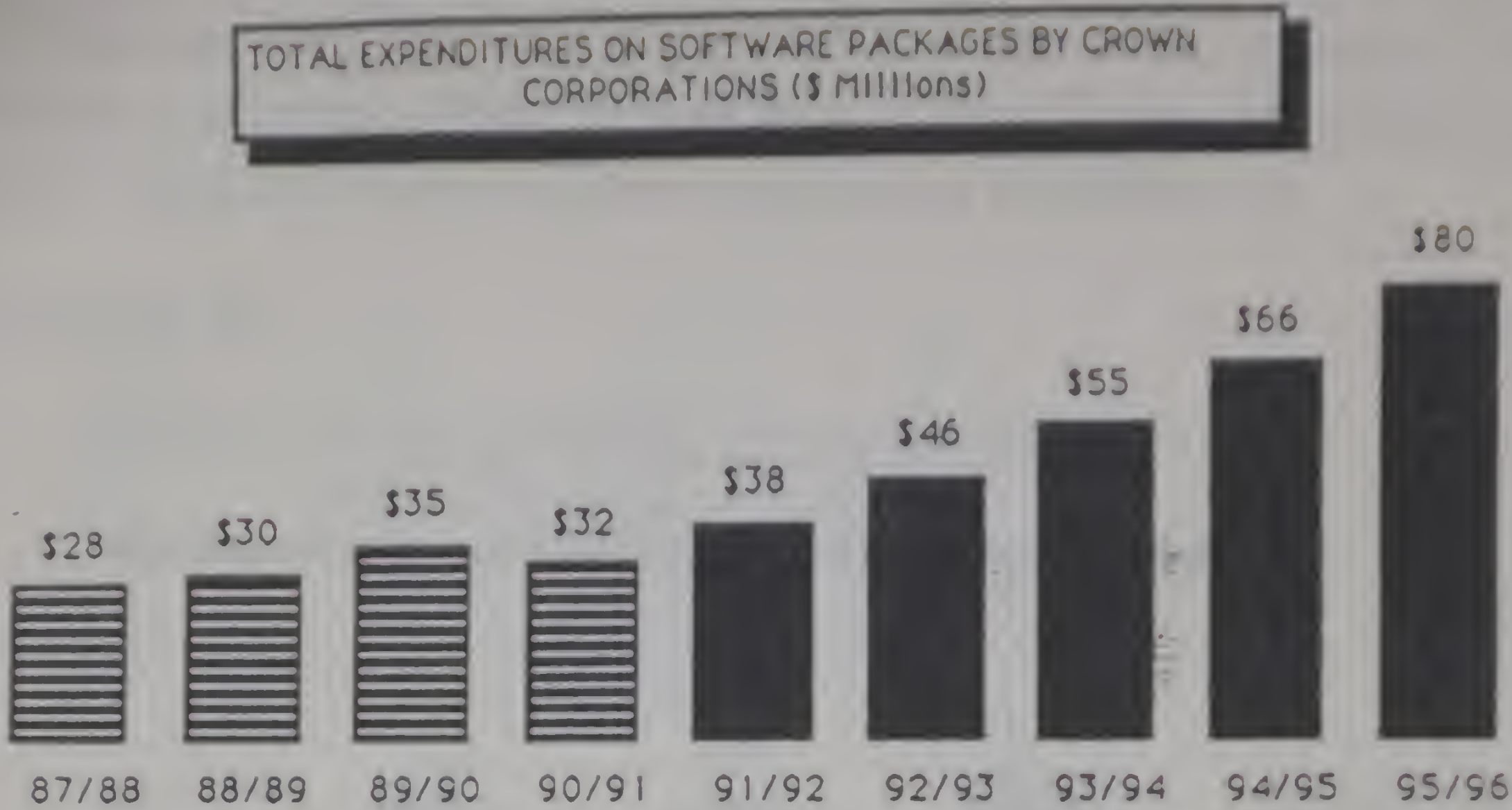
3.2 - Crown Corporations

In comparison, the software packages expenditures profile of the 13 Crown corporations investigated during the study uncovered some similarities and dissimilarities.

As shown in Exhibit 13 Crown corporations together spent \$35 million on software packages in 1989/90. It is estimated that during the period from 1987-1988 to 1990-1991, expenditures on software packages will have grown by a compound annual growth rate of 12% which is slightly below the industry average.



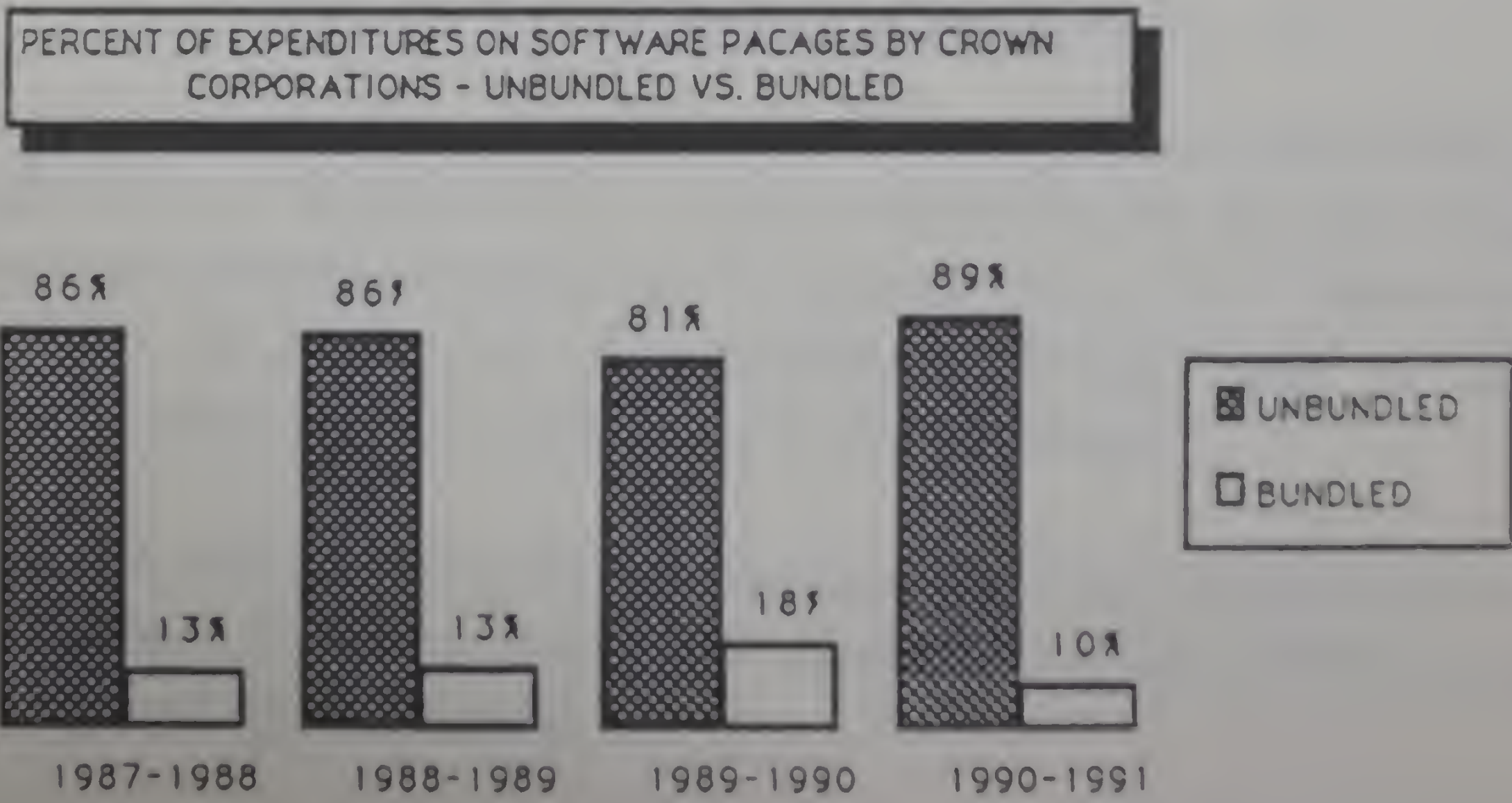
EXHIBIT 13



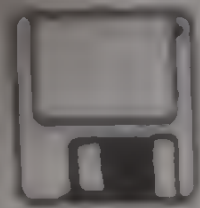
Number of Respondent Organizations - 13

Of the packaged software that is acquired, the vast majority is unbundled (Exhibit 14).

EXHIBIT 14



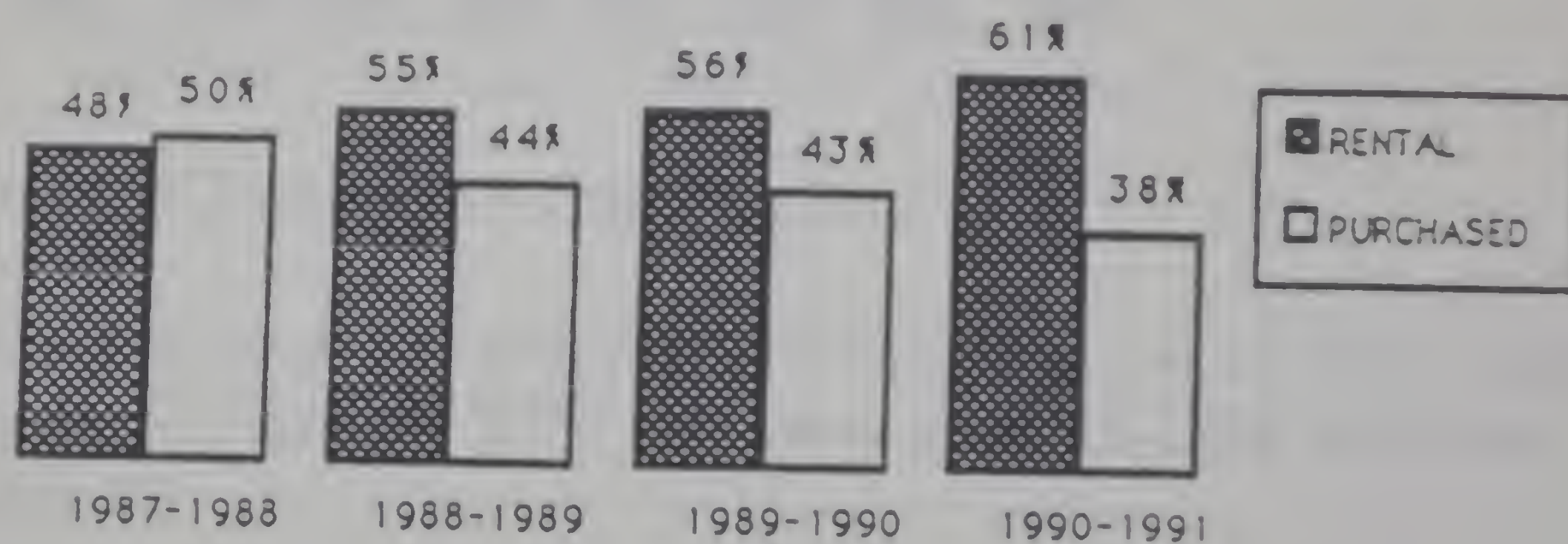
Number of Respondent Organizations - 13



However, the profile of software packages expenditures among the 13 Crown corporations differed from the total group of 29 in a number of ways. First, it was found that Crown corporations rent more than purchase software packages (Exhibit 15).

EXHIBIT 15

PERCENT OF EXPENDITURES ON SOFTWARE PACKAGES BY CROWN CORPORATIONS - RENTAL VS. PURCHASED



Number of Respondent Organizations - 13

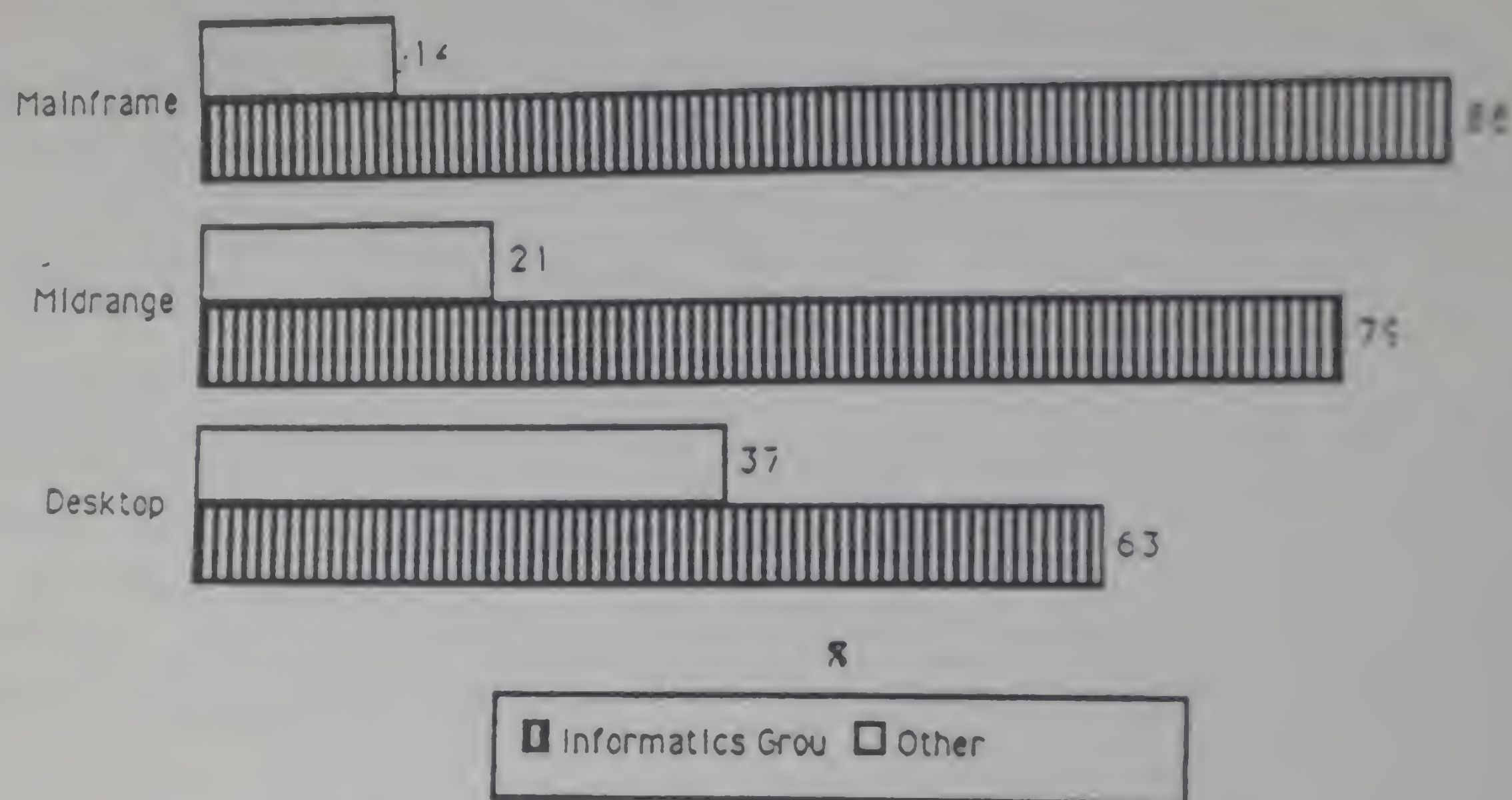
They also spend more on Systems/Utilities than User Tools and Applications (Exhibit 16). In fact, expenditures in this category have been steadily increasing at a growth rate of 6%. This is due to the fact that Crown corporations typically had a higher concentration of IBM and/or PCM mainframes.

This data also suggests that Crown corporations lag behind federal government departments in the absorption of User Tools such as DBMSs and Spreadsheets.



EXHIBIT 56

Software Acquisition Process - Degree of Involvement by
Informatics by Hardware Tier



6.2 - Standards

There are several standards in place within the respondent organizations. These are identified and discussed below.

6.2.1 - Organizational Level

Twenty-three of the 29 respondent organizations indicated that there are no distinctions between organizational levels, namely the Corporate/DM, Department/ADM, and/or Workgroup/Director-General/Director levels in terms of software standards.



6.2.2 - Software

WordPerfect is the standard word processing package. Twenty-one organizations indicated they used this product. The second most common word processing package was IBM's Displaywriter.

Lotus 1-2-3 is the standard spreadsheet package used by 19 of the 29 organizations interviewed. No other package emerged as the second most common spreadsheet in use although interest in Microsoft's Excel is growing.

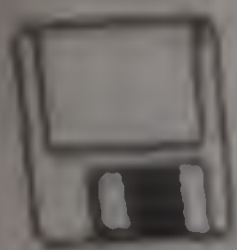
Thirteen organizations indicated that they had standardized on Ashton-Tate's dBase III or IV as the DBMS of choice at the micro level. However, interest in PC/Oracle is growing and it seems to be in an excellent position to replace dBase as the standard desktop DBMS. Four organizations are using PC/Oracle, and several others indicated intentions to acquire or investigate.

Oracle was also very prevalent at the midrange computer level. In fact, it is the 'de facto' standard DBMS at the midrange by virtue of its installed base. However, it is important to note that Cognos' PowerHouse is the 'de facto' standard 4GL at the midrange level.

At the mainframe level, two packages were predominant. Cullinet's IDMS and IDMS/R have significant penetration in this marketplace. However, satisfaction with this product is decreasing due to its lack of 'true relational' qualities. Software AG's Natural/Adabas is the second most frequently mentioned package.

6.2.3 - Operating Systems and Hardware Platforms

At the desktop level, the ubiquitous IBM PC & Compatible is the 'de facto' standard. Twenty-six organizations have standardized on this platform as the desktop of choice. Only three organizations have selected the PS/2 as the platform of choice.



Similarly, twenty-eight organizations indicated that they have standardizing on MS-DOS as the desktop operating system of choice. Only one organization indicated that they are adopting OS/2 as their mainstream desktop operating system.

Of the 17 organizations who have midrange computers installed, eight are DEC VAX/VMS shops. Clearly, with almost 50% of the organizations who use midrange computers using VAX systems it is apparent that this hardware platform is a 'de facto' standard. It is important to note that many respondents mentioned DEC's VAX system as the midrange of choice for future acquisitions. At the same time, VMS is the standard operating system in use at the midrange level. This may change in the future with the increasing use of UNIX in mainstream computing environments.

The second most frequently mentioned hardware and operating system environment was Hewlett-Packard's 3000 and MPE respectively. However, due to the relatively smaller installed base of this environment compared to DEC VAX, it unlikely that it will emerge as a standard.

Three organizations expressed interest in adopting UNIX as the midrange environment of choice. One of the three is currently implementing UNIX at this level.

Of the 19 organizations who are using mainframe computers, 15 are IBM S/370 environments. These organizations primarily use MVS/XA as their mainframe operating system. Two organizations indicated that they were considering implementing or were implementing UNIX at the mainframe level to co-exist with their MVS/XA environment.

The most frequently mentioned LAN environments were Novell, 3Com and Banyan Vines at the desktop level. The most frequently mentioned LANs at the midrange and mainframe levels were DECnet, Token Ring and SNA.



6.2.4 - Technical Standards

The study respondents were asked to identify those technical standards that they believe will impact procurement of or that will be taken into consideration when acquiring packaged and/or internally developed software within their organizations during the next 3 years. The following are the most frequently mentioned standards:

EXHIBIT 57

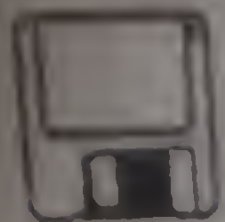
Technical Standards That Will Impact Software Procurements

Standard	Number of Mentions
SQL	23
X.400	23
ISO/OSI	22
ISDN	18
EDI	17
UNIX	10
WINDOWS	9
ODA/ODIF	6
SAA	6
SGML	5
SNA	2

Respondents clearly indicated that products lacking compliance with certain standards would not be considered.

6.2.5 - Standards Groups

Forty-eight percent of the respondent organizations indicated that the Treasury Board's activities in the standards area had little impact on their software procurement practices except in the areas of bilingualism and SQL compatibility. The majority of



respondents indicated that standards were largely determined by the market.

6.2.6 - Information Technology Environment

Despite the preponderance of IBM MVS/XA and DEC VMS at the mainframe and midrange levels for instance, respondents from 16 of the 29 organizations felt their organizations were adopting or currently had an 'Open Systems' environment. This is interesting given the term 'Open System' is synonymous with UNIX. Only 5 organizations felt they were adopting or had a proprietary environment. Another 5 organizations indicated that they had both an 'Open' and 'Proprietary' systems environment.



7.0 - FUTURE REQUIREMENTS IDENTIFICATION

All 29 respondent organizations were asked to identify their future informatics requirements.

Fifteen of 27 organizations indicated that they were increasingly relying on more 'off-the-shelf' packages to address their system requirements. Eleven organizations indicated that they were relying more on custom development to address these requirements. One organization indicated that they were relying on both 'off-the-shelf' packages and custom development. The following table identifies those requirements that the respondents indicated were being addressed using 'off-the-shelf' packages or custom development.

EXHIBIT 58

Informatics Requirements Currently Being Addressed by Off-the Shelf Packages and/Or Custom Development

Requirement	Off-the-Shelf	Custom Development	Number of Organizations Answered
Financial Systems	16	13	29
Program Management Systems	8	21	29
Text Management	18	11	29
Data Analysis	17	12	29
Administrative Systems	7	22	29
Human Resource Systems	6	23	29

The respondents were also asked to identify requirements that are currently not being addressed by off-the-shelf software and/or custom development. The following table lists the responses.



EXHIBIT 59

Informatics Requirements Not Currently Being Addressed by Off-the Shelf Packages and/Or Custom Development

Requirement	Number of Mentions
Text/Document Management	5
Bilingual Conversion	4
Artificial Intelligence	2
CASE	2
Consistent User Interface	2
Correspondence Tracking	2
Executive Information Systems (EIS)	2
Graphics/Graphics Server	2
Security	1
4GL	1
Accounting	1
Administrative Information System	1
CAD/CAM	1
Capital Assets	1
Cargo System	1
Communications	1
Desktop Publishing	1
Electronic Forms Management	1
Financial System	1
Fixed Assets	1
GIS	1
Human Resource Compensation System	1
Image Processing	1
Inventory System	1
Network Management	1
Office Automation	1
Optical Storage and Retrieval	1
Peer to Peer Processing	1
Project Management	1
Robotics	1
Warehouse Inventory System	1
Yield Management System	1

The respondents were also asked which of the following specific technologies were of interest and/or importance to their respective organizations. Productivity products, such as DBMS, 4GL and



CASE, received the most mentions. Other than productivity products, Executive Information System (EIS) received the next highest number of mentions. The table outlines the detailed results.

EXHIBIT 60

Technologies of Interest to the Respondents

Technology	Interested/ Important	Not Interested/ Not Important	Number of Organizations Answered
DBMS	26	3	29
4GL	25	4	29
CASE	25	4	29
Executive Information Systems (EIS)	22	7	29
Text DBMS	22	7	29
Data Repositories	16	13	29
Live Link Between Programs	11	18	29
OTHER	11		
AI	1		
Communication	1		
Desktop Publishing	1		
GIS	1		
Integrated Office Automation	1		
Optical Storage/Retrieval	2		
Reverse Engineering	1		
Satellite Communication	1		
Supercomputing	2		
Financial Desktop Publishing	8	21	29



8.0 - CONCLUSIONS

Based on the information obtained from 16 federal government departments and 13 Crown corporations, it is evident that the federal government is a huge market for information technology goods and services, and more specifically for software packages and systems development.

Together these 29 organizations spent \$231 Million in 1988/89 on developing systems that were not sourced off-the-shelf. During the same year, these organizations expended \$72 Million on software packages. Expenditures on software packages and system development will continue to grow, although growth in the former will be more pronounced. Software packages expenditures are expected to grow by a compound annual growth rate of 17%. While system development expenditures are still expected to grow at a rate of 6% each year.

Within the 29 organizations who participated in the study there is a large inventory of software packages. At the desktop level, 169 packages, from 99 suppliers, are currently in use. At midrange level there were 119 products and 49 software suppliers were identified. Finally, at the mainframe level, 395 products and 128 suppliers were identified. In total, there are 683 unique software packages in use throughout the 29 organizations. Only a fraction of these products are produced by Canadian companies.

The major products in use include: WordPerfect, Lotus 1-2-3, dBase, Harvard Graphics and Norton Utilities at the Desktop level; All-In-One, 20/20, PowerHouse, Oracle and CEO at the Midrange level; and, Adabas, CICS, ISPF, PL/1, Netview/MVS, Easytrieve, Focus, DBA Toolkit, IDMS/R, SAS, Omegamon and Syncsort at the Mainframe level. The only Canadian product amongst the above that has a significantly large installed base is PowerHouse.

In the system development area, there are massive projects currently being undertaken or planned. Despite the respondent's



desire to use software packages to address these requirements, the unique information requirements of the 29 organizations in most cases require custom development. As a result, these organizations have an incredible library of applications that need to be maintained.

In some cases, many of these applications can be commercialized for other federal government or non-government organizations. The development of these applications has also developed a large pool of software engineering talent both employed within the federal government and by the consulting sector.

The major operating system environments in the federal government are MS-DOS, VMS and MVS/XA. Unix is growing within the federal government market but not at the rate it has been in the U.S. government. During the next five years Unix will become more prevalent in mainstream computing environments.

The federal government is also increasing its base of desktop base at an incredible rate. In some cases, a few of the 29 organizations have already achieved the objective of placing one desktop machine on every employee's desk. For the rest, this will be achieved during the next five years. This growth on desktop computing has placed several demands on organizations, most notably access to corporate data.

There are tremendous opportunities for the software sector in the federal government. The federal government expenditures on software, both packaged and custom developed, is significant. In aggregate, the federal government represents one of the largest segments of the software and services industry in Canada.

In the 1990's, the federal government will focus its attention on improving productivity with tools such as 4GL, DBMS and Case. But it will also concentrate on managing the vast amount of hardcopy 'text' data through a combination of software and hardware technologies. Although over 90% of all text data is



currently stored in hardcopy format, much of this data will be electronically stored by the end of this decade.

One emerging area of opportunity is GIS - Geographic Information System. This method of visually accessing and displaying data will become commonplace in the federal government in the future.



APPENDIX A - STUDY DEFINITIONS

We are attempting to obtain information in a specific format. In order to ensure consistency, the following describes terms that are frequently used throughout the survey. These will assist you in assembling and categorizing the desired information.

Packaged Software

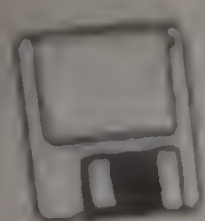
Packaged software is often referred to as 'pre-packaged', 'pre-wrapped' and/or 'off-the-shelf' software; it is software that has already been developed for immediate use within the market as a whole. Packaged software includes Systems/Utilities, Users Tools and Applications software. Examples of packaged software include OS/2, Xenix, VMS, Oracle, PowerHouse, Omegamon, Lotus 1-2-3, MacPaint, Word, WordPerfect, Excel, IMS, and DB/2.

Systems/Utilities Software

Systems/Utilities software are programs concerned with the operation of the computer and the running and testing of applications programs, particularly in relation to input/output. Included are Operating Systems, Debuggers, Interpreters, Compilers, Sort/Merge and Communications software.

User Tools Software

User Tools software are programs that assist in the development of other applications. These include traditional end-user tools, such as spreadsheets (e.g. 20/20, Lotus 1-2-3, Excel), and application development tools such as data base management systems (e.g. Oracle, DB/2), CASE (e.g. Excelsior), 4GLs (e.g. PowerHouse, Focus), Code Generators (e.g. Gamma), and Artificial Intelligence/Expert System Shells.



Applications Software

Applications software are programs that address a single requirement or are specific to a particular end use. Examples of applications software are: Accounting, Word Processing, Graphics, Integrated Office, CAD/CAM, Project Management, etc.

Bundled Software

Bundled software is software that comes with the hardware or total system. The price of the software is included in the cost of the entire system. Any software packages can be bundled. For instance, Hypercard comes 'bundled' with every Macintosh.

Unbundled Software

Packaged software that is purchased separately from the hardware or is identified as a separate requisition item is unbundled software.

Rental Software

Rental software is software that is 'rented' for a period of use, including both short term (i.e. monthly) and long term leases (i.e. yearly). For instance, large IBM mainframe users often pay an annual fee for the use of the operating system (e.g. MVS). This is different from a single purchase payment which grants the user a license to use the software for an indefinite period.

Internally Developed Software

Internally Developed software is software that is 'custom' developed for the purpose of addressing unique system requirements that cannot be purchased 'off-the-shelf'. Internally developed software can be classified into two groups, Existing System Enhancement/Maintenance and New System Development. System Enhancement/Maintenance refers to the ongoing enhancement and maintenance of existing systems. New System Development refers to systems that are built entirely from scratch.

A variety of supplier types provide internally developed software services, including the private sector, other federal government



departments, agencies and Crown corporations, and internal development resources. The services these suppliers provide include 'custom' systems development on a project basis, as well as the contracting of individual developers for projects often referred to as 'body shopping' or 'Renting A Body'.

Desktop Computer

A computer in which the CPU resides on the users' desktop is referred to as a desktop computer. There are two classes of machines in this category.

Single User Workstations are typically priced less than \$15,000. Single User Workstations are characterized by one user per CPU.

Multiuser Workstations/Servers are typically priced from \$10,000 to \$30,000. These machines are characterized by more than one user per CPU.

There are a plethora of machines that can be classed as desktops; some of the more familiar are Sun Workstations, Apple Macintosh, IBM PC and Compatibles, IBM PS/2, Apollo Workstations, Compaq and Toshiba.

Midrange Computer

A computer in which the CPU does not reside on a desktop is a midrange computer. Typically, these systems range in price between \$15,000 to \$900,000. These machines characteristically have rack or cabinet-size packaging. Included in this category are minicomputers, super minicomputers, and minisuper computers. Computers such as DEC's VAXs, DG Eclipse MV, IBM System/3X, IBM AS/400, IBM 9370, NCR Tower and HP 3000 are examples of midrange systems.

**Mainframe Computer**

Mainframe computers are typically priced more than \$900,000. Included in this category are mainframe computers and supercomputers. The IBM 43XX and 3090 series, Amdahl 470 Series, Unisys 1100 Series, Honeywell's DPS 8 series and Cray supercomputers are examples of mainframe systems.

Centrex

Centrex stands for Central Exchange and is a business telephone system which provides switching services. The service uses a special switch that either resides at the central office (or at the telephone company) or at a remote switching site. The switch does not reside at the client's site. It is not a product owned by the customer, but is a service provided by the telephone company using a switch and software that remains the property of the telephone company.

PBX

PBX, or Private Branch Exchange, is a private switching system placed at the customer's site. The customer may own the switch and lease a number of lines from the telephone company, or he may lease the switch itself as well as the other telephone equipment. PBXs range in price from \$10,000 to over \$500,000. They can support up to 30,000 lines. Examples are Mitel's SX-2000 and Northern Telecom's SL-1.

Key Telephone Systems (KTS)

A private switching system in a small office complex that provides immediate access to all users by pressing one or two keys is a Key Telephone System (KTS). All users may obtain access to lines on the public network and may communicate with each other without needing the services of an operator. KTS range in price from under \$10,000 to \$50,000 and they can support up to 100 lines. An example of a Key Telephone System is Northern Telecom's Norstar.

**Multiplexers**

Multiplexers are products that allocate bandwidth utilization. It assists in combining individual information-carrying channels for transmission over one bearer (e.g. line, fibre or radio) using frequency or time division techniques.

Local Area Networks (LANs)

LANs are hardware/software products including cables, interface cards and network operating systems which permits users to connect computer equipment into a system within a building. LANs facilitate the passage of data between computers and sharing of common peripherals such as printers and storage devices. There are four types of LANs: high speed LANs connecting mainframes with mainframes (e.g. Network Systems' HYPERchannel); industrial LANs used in the automated factory (e.g. Concord Communications); corporate/general purpose large-scale LANs which link assorted types of equipment within a multi-vendor environment throughout the building (e.g. IBM Token-Ring, WangNet, DECnet, AT&T ISN); and PC LANs used for connecting personal computers in a local area network (e.g. Novell, 3Com, Sun TOPs, Banyan).

Wide Area Networks (WANs)

WANs are the same as LANs, except they permit users to connect computer equipment into a system between buildings.